PRESENTED BY

U. S. GOVERNMENT

57TH CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { DOCUMENT No. 6.

ANNUAL REPORTS

OF THE

DEPARTMENT OF AGRICULTURE

FOR THE

FISCAL YEAR ENDED JUNE 30, 1901.

REPORT OF THE

SECRETARY OF AGRICULTURE.

DEPARTMENTAL REPORTS.

WASHINGTON:
GOVERNMENT PRINTING OFFICE,
1901.

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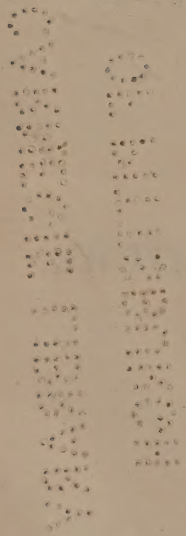

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REPORT

OF THE

SECRETARY OF AGRICULTURE.

REPORT

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To the President:

The Department of Agriculture has reached farther into sympathy with the industries of the people during the past year. It has identified itself more intimately with the experiment stations of the several States and Territories and what pertains to the interests of their people. It has gone farther in foreign lands to find many things that will be valuable to our producers. The grouping of related sciences into Bureaus has economized time and contributed to efficiency. The process could be advantageously extended to other Divisions and Offices that are growing beyond their present environment.

The education of student assistants and scientific aids in their several specialties goes on satisfactorily under the scientists in charge, giving promise of high efficiency in the future personnel of the Department.

NEW BUILDING NEEDED.

The growth of the Department causes continual overflow into rented buildings that now cost over $10,000 a year. This, and the danger of loss by fire of material that has been accumulating for years and could not be replaced, induced the Congress to appropriate $5,000 at its last session to provide for the selection of an architect and plans for a new building, which has been done with the cooperation of the Architect of the Treasury, under whose direction a commission was selected to pass upon the drawings, consisting of Messrs. D. H. Burnham, C. F. McKim, Augustin Saint Gaudens, F. L. Olmsted, jr., and James Knox Taylor, and a report upon the action taken will be submitted to the two Houses of Congress at an early date.

OUR DUTY TO NEW POSSESSIONS.

The extension of American jurisdiction over islands in the Tropics brings new problems to the student of agricultural science. We buy annually over $400,000,000 worth of the products of foreign fields,

one-half of which will, at no distant period of time, be grown in the United States; the other half is the product of such climates as prevail in our new island possessions. It is the privilege and duty of the Department of Agriculture to teach the people of those islands to produce what we now buy from tropical countries, that they may have incomes to help toward their growth in all desirable directions.

The topics discussed in the reports of the Bureaus, Divisions, and Offices of the Department are indicated in the following brief paragraphs.

SUMMARY.

The Weather.—The Weather Bureau has established cooperation with Europe in the interchange of weather forecasts. The farmer in the country is receiving his weather forecasts with his mail through rural free delivery. Progress is being made in perfecting wireless telegraphy.

Animal Industry.—Our animals are the healthiest in the world, and the people at home and abroad are protected by the inspection of meats in 51 cities and 156 abattoirs. Exports of animals and animal products amount to $253,000,000. Imported animals are inspected. Animal diseases are being eradicated by serums and vaccines sent out from the Department. State restriction of interstate traffic in live stock is in the courts.

Plant Industry.—The diseases of cotton and other plants are being investigated. Plant breeding to obtain forms that will resist disease and be better adapted to new and changed conditions is being successfully carried on. A new method of cultivating and distributing the seeds of bacteria that cooperate with leguminous plants in developing nitrogen has been discovered. Antidotes for many poisonous plants have been found. Improved methods of curing grass seeds have been put in operation. Experiments with clover seeds show the superiority of the American over the foreign kinds. Tropical agriculture is being studied and the people of our island possessions are being taught better methods of growing coffee and other plants. The improvement of grasses on the Western ranges is being studied. Cooperation is had with most of the experiment stations about the country. Markets for our fruits are being successfully opened in foreign countries. The hop, prune, and other industries of the Pacific coast are being helped by the Department's investigations and importations. The Arlington farm is being brought into condition for use. Satisfactory results are being obtained from tea cultivation. Macaroni wheats are being successfully grown in our semiarid localities. Superior barleys for commercial purposes have been introduced. Egyptian cottons are being successfully grown, and the importation of the date palm has been a success. The Congressional seed distribution has been reorganized.

Soils.—The Bureau of Soils is a necessity to find suitable soils for the new plants introduced, as well as the soils most suitable for our staple crops. Sumatra tobacco is being successfully grown in the Connecticut Valley and in Florida. Experimentation is being conducted in Pennsylvania in the growing of Havana filler tobacco, and this will be extended to Ohio, Texas, and the island possessions. The growers of the several fruits, table vegetables, and sugar beets, both

East and West, are being helped by the finding and mapping of suitable soils. Soil surveys are of benefit to Western irrigated districts. State organizations are cooperating in soil investigations, and these will be extended to the island possessions to help them in producing what can not be grown in the United States. Extensive areas of alkali lands in the mountain States are being reclaimed in cooperation with the Bureau of Soils. New processes of tobacco fermentation avoid losses by black rot.

CHEMISTRY.—The composition, nutritive value, and adulteration of food products are inquired into, and extensive work is done in the study of food preservatives. Much work has been done in the investigation of the adulterations of imported food products, and the results will soon be given to the public. The chemistry of woods is studied in cooperation with the Bureau of Forestry. A special study is made of the problems relating to sugar-producing plants. The physical and chemical study of road materials is now established in the laboratory. Work is done in the laboratory of this Bureau for all Departments of the Government.

FORESTRY.—The study of forests, forest fires, forest grazing, commercial trees, lumbering, and forest products for the Federal and State governments and for private individuals is included in the work of this Bureau. Tree planting for wood lots, shelter belts, and commercial plantations is a prominent feature. Assistance is given to the Interior Department in the study of the scientific work of the forest reserves. This Bureau is getting into close touch with all the forest interests of the country. Over 52,000,000 acres of forest lands throughout the United States are under its consideration. Commercial lumber companies in all parts of the country are asking help in the management of their properties. An Appalachian forest reserve, to protect the headwaters of important Southern streams, is recommended. Investigations to improve the methods of turpentine orcharding are being conducted.

EXPERIMENT STATIONS.—Inquiry shows that the experiment stations of the several States are working in the interest of their respective localities. Satisfactory progress is being made and the States are more liberal in helping the stations. The Department of Agriculture is cooperating extensively with the stations. Satisfactory reports come from the work in Alaska, which the people there are appreciating. Progress is being made in the establishment of experiment stations in Hawaii and Porto Rico, and there is much need of a beginning in the Philippines. Improvement is suggested in agricultural education. The farmers' institute work might be assisted. Interest grows in the study of the nutrition of man. Economy in the feeding of the human family would promote health and save money.

Irrigation.—The irrigation laws of the States have been studied and investigations made of the methods by which water is conserved, distributed, and used. The titles to water should be better understood and the disposal of water should be safeguarded. The Department's investigation is suggesting the enactment by the States of new and more intelligent legislation. The people interested should sanction all innovations, and they should be helped to do what localities can not do. Extensive irrigation works, such as the damming of large rivers, should be built by the Federal Government.

ENTOMOLOGY.—This Division has completed its work with the fig-fertilizing insect and has written up its history. Probably 75 tons of figs fertilized in this way will be put on the market this year. The original home of the San Jose scale has been found, after long investigation in the Orient, to be in northern China. The beetle that preys upon it is being brought in considerable numbers to the United States for distribution to orchards. The scale was found near the Great Wall, where no foreign nursery stock of any kind had ever been introduced. Its natural enemy keeps it in such check there that the native fruits grow successfully. After eight years of effort success has been reached in the introduction into the United States of a caterpillar from Italy that preys upon the black scale, a serious enemy to olive and citrus trees in California. This scale is a native of the region from which the caterpillar has been introduced, and along the shores of the Mediterranean the latter keeps the scale in subjection. A beetle has been introduced from Hungary that is a natural enemy to several destructive plant lice which have been accidentally imported into this country from Europe. A fungous disease of grasshoppers has been imported from South Africa and experimentally used in different parts of the United States through the summer of 1900–1901. In some localities it appears to have taken hold successfully.

Other work of this Division may be summarized as follows: During the past year the insects affecting the violet, the rose, and other ornamental plants have been studied. Work has been done in cooperation with the Bureau of Soils looking to the eradication of mosquitoes. A study of flies has indicated the importance of these creatures in the carriage of internal diseases. Systematic work is being projected to deal with the cotton-boll weevil of Texas.

PUBLIC ROADS.—This Office studies the condition of the roads, publishes information with regard to their improvement, the obstacles in the way, and the best means of securing better highways. Object-lesson roads have been built in nine States during the past year. The laboratory for testing the chemical and physical properties of road materials, conducted under the direction of the Bureau of Chemistry, has been in successful operation during the year. An agent of the Department is located in each of four geographic subdivisions of the United States to study and report upon local conditions.

PUBLICATIONS.—The work of this Division affords a fair reflex of the activity of the Department. During the year 1901 there were issued 606 publications, aggregating nearly 8,000,000 copies. Of these, 3,345,000 were Farmers' Bulletins. The Yearbook of the Department continues to be in great demand. Many of the Department's agents throughout the country receive no compensation except copies of our publications. A larger number of the Yearbook should be assigned to the Department. The publications of this Department are in demand among the people. The agent who sells governmental documents shows that during 1901, 24,127 copies of publications from this Department were sold, as against 9,458 from all other Departments. Congress at its last session greatly increased the number of Farmers' Bulletins to be printed and furnished to Members. A sufficient amount of money for their publication and distribution was not appropriated.

FOREIGN MARKETS.—Agriculture contributed conspicuously to the expansion of American commerce during the past year. The highest

record attained in the exportation of agricultural products previous to last year was surpassed by more than $90,000,000 for the fiscal year 1901, when a value of over $950,000,000 was reached. Fully 65 per cent of domestic merchandise sent abroad during that year originated on the farm. The most important foreign markets for our surplus products are in the United Kingdom, Germany, France, the Netherlands, and Belgium. We sent to Cuba, Porto Rico, and the Philippine Islands in 1901, $18,600,000 worth of exports, being about 53 per cent of their receipts in those islands. They are increasing in Porto Rico and the Philippines, and declining in Cuba. Our imports from these three island groups increased from $36,162,000 in 1900 to $48,600,000 in 1901, the bulk of the gain being in the imports from Cuba. Of the $70,000,000 worth of domestic merchandise exported from the Pacific coast during the fiscal year 1900, $45,000,000 worth consisted of farm produce.

LIBRARY.—We have the most extensive agricultural library in the country. Four thousand books and pamphlets were added during the past year. Reference lists with regard to publications on land drainage, tobacco, etc., have been prepared. The constantly broadening field of investigation makes increased demands upon the Library, and it is necessary that our scientists have access to the work done at home and abroad. The agricultural colleges and experiment stations are drawing upon the resources of the Library to assist them in special work. An increased appropriation to permit of the engagement of scientific aids in library work is much needed. The Library room, like the other quarters of the Department, is entirely inadequate.

ACCOUNTS AND DISBURSEMENTS.—Congress appropriated $3,303,500 for the Department for the fiscal year ended June 30, 1901. Final payments will amount to about $3,200,000. Owing to inadequate accommodations in the Department proper, our rentals for outside buildings for the fiscal year 1902 will exceed $10,000.

BIOLOGICAL SURVEY.—This Division is engaged in mapping the boundaries of the natural crop belts of the country, and aims to furnish the American farmer with lists of crops likely to succeed in different parts of the country. The work has been done in Texas and California to a great extent during the past season. A fiber plant has been discovered that grows over 20,000 square miles of land in Texas, and the Biologist thinks that the fiber of this plant may take the place of over $12,000,000 worth of the fiber of other species of agave annually imported, mostly from Mexico. The fog zones of California mostly run north and south, owing to the trend of the mountains, and interesting deductions for fruit growers are reached. The prairie dog of the great plains that stretch from Montana and the Dakotas into Texas is increasing rapidly, owing to the destruction of its natural enemies, to the serious injury of pasture grasses. Field experiments are being conducted looking to its destruction.

Observation of birds in southern California shows that two of them feed extensively on the olive scale. The large blackbirds of southern Texas that feed on crayfish which cut the rice plant and on the cabbage worm have been slaughtered in great numbers for the millinery trade. These studies in ornithology have a direct bearing upon crop production. Farmers' Bulletins on these topics are being distributed in large editions. This Division is charged with the supervision of

matters relating to game protection and introduction and executes the Lacey Act. It gives permits for the importation of birds and supervises their movement in interstate commerce. This service will be extended to Hawaii in the coming year. More liberal appropriations are required to carry on the valuable work of the Biological Survey.

STATISTICS.—The Division of Statistics has 250,000 reporters located throughout the United States, who furnish facts monthly regarding the crops. Its work consists in the preparation of reports relative to the principal products, the condition and prospects of the crop during the growing season, and the quantity, quality, and disposition of the product harvested. There is urgent necessity for extending this work to other products, such as live stock, fruits, sugar, rice, etc. Agents are already organized to collect the facts, and only the addition of a sufficient number of compilers to collate and analyze these facts is necessary to the extension of the work. Negotiations with foreign governments, looking to the telegraphic interchange of crop reports, have been undertaken. The statistician has had marked success in estimating the cotton and other crops during the last few years.

WEATHER BUREAU.

NEW OCEAN FORECASTS AND INTERNATIONAL COOPERATION.

An important extension of the forecast work of the Weather Bureau has been made during the year. By an arrangement with the secretary of the meteorological office at London, England, the transmission by cable from London to Washington of meteorological reports from certain points in the British Isles and on the Continent of Europe, and from Ponta Delgada, Azores, was begun December 18, 1900. These reports, with observations from Nassau, Bermuda, and Turks Island, have been regularly published on the daily weather maps issued at Washington, Baltimore, Philadelphia, New York, and Boston, together with forecasts of the force and direction of the wind and the state of the weather for the first three days out of steamers bound east from American ports.

The Atlantic forecasts, which are based on the American, Atlantic, and European telegraphic reports, were begun January 7, 1901, and on June 1, 1901, they were made a part of the regular general night forecasts issued at Washington. In a number of instances, when storms of marked strength were passing eastward off the American coast, forecasts were issued of the character of the weather which would probably be experienced by steamers leaving European ports westward bound, and by an arrangement with Lloyd's, of London, these advices have been cabled to England.

In addition to the daily forecasts of wind and weather and special storm warnings, predictions of fog have been issued when conditions favorable for fog development have been indicated in the steamer tracks west of the fiftieth meridian. Reports from trans-Atlantic

steamships show that these forecasts and special warnings have been well verified.

In November, 1900, arrangements were made with Portugal to receive reports from the meteorological observatory at Horta, in the Azores. Observations are now regularly received by cable from that place, and they are of much value in the work of forecasting the movements of storms on the Atlantic Ocean.

THE GALVESTON HURRICANE.

The principal storm of the year was the West Indian hurricane which devastated Galveston, Tex., September 8, 1900. This was one of the most destructive storms on record. Upward of 6,000 human lives were lost, and property to the estimated value of $30,000,000 was destroyed.

The wisdom of Congress in appropriating for the establishment of weather stations in the West Indies was well demonstrated by the warnings that were issued well in advance of this storm, from the time of its inception in the Caribbean Sea to its arrival at Galveston, and thence throughout its course to the Great Lakes and onward to the Atlantic Ocean.

NEW FORECAST DISTRICTS.

Three additional forecasting districts have been established and designated as the New England district, the West Gulf district, and the Rocky Mountain district, with headquarters at Boston, New Orleans, and Denver, respectively. The last appropriation bill passed by Congress made provision for three additional forecast officials to be placed in charge of these districts with authority to issue forecasts and warnings for the several States that are comprised in each district. This system has the advantage of enabling the forecaster to devote more time to the consideration of the predictions for each State and of securing an earlier distribution of forecasts. As these forecast officials were selected on account of their ability as forecasters for their respective sections, it is expected that an improved service will result.

IMPROVEMENT IN FORECASTS.

Special consideration has been given to the subject of increasing the accuracy of the forecasts of the Weather Bureau to the highest degree attainable, and as a means of stimulating among the employees of the Bureau the study of the problems of weather forecasting announcement has been made that hereafter marked success in forecasting, the invention of new methods of forecasting, or the discovery of new facts

or principles of marked value to the forecaster will have a special weight in considering the merits of employees of whatever grade for promotion.

RECENT EXTENSION OF WEATHER SERVICE.

It is a wonderful picture of atmospheric conditions that is now presented twice daily to the trained eye of the weather forecaster. In addition to the reports from Europe, the Azores, and Bermuda, the field embraces an area extending from the Atlantic to the Pacific, from the north coast of South America over Mexico, the islands of the West Indies and the Bahamas, northward to the uttermost confines of Canadian habitation. It is a panoramic picture of the exact air conditions over this broad area that is twice daily presented to the study of our experts. Hurricanes, cold waves, hot waves, or rain storms are shown wherever present in this broad area. Their development since last report is noted, and from the knowledge thus gained their future course and intensity is quite successfully forecast. Every twelve hours the kaleidoscope changes, and a new graphic picture of weather conditions is shown. Nowhere else in the world can meteorologists find such an opportunity to study storms and atmospheric changes.

CLIMATE AND CROP WORK.

The lines of work pursued in previous years by the climate and crop service of the Weather Bureau were continued and extensions and improvements made wherever possible. The cotton-region service has been extended into Oklahoma and the Indian Territory, and arrangements have been made for inaugurating a similar work in California, to be known as the fruit and wheat service.

FORECASTS TO FARMERS BY RURAL FREE DELIVERY.

Particular attention has been given to the distribution of forecasts by means of the rural free delivery. There are now in operation 365 centers, supplying an aggregate of nearly 42,000 families in the farming districts with the latest weather predictions. This work has become decidedly popular, and we have had the hearty cooperation of the Post-Office Department in making it a success. With some additional appropriation, it is the intention to reach several hundred thousand farmhouses with the daily forecasts and warnings during the coming year. The value of frost and cold-wave warnings to rural communities is beyond estimate, and the rural free delivery of the Post-Office Department places the means at our command of reaching those who can be the most benefited by these warnings.

WIRELESS TELEGRAPHY.

The vast extent of our sea and lake coasts and the intimate communication between the Weather Bureau stations of this Department, which are distributed along these coast lines, and the vessels of commerce have induced me to authorize persistent and systematic experimentation in etheric space telegraphy. Substantial improvements have been made during the past year in the Department's system.

The line of research has been divided into three classes: First, the perfection of a more powerful transmitter, in which the energy of radiation shall be greatly increased; second, the devising of a more delicate receiver—one that would be positive instead of depending upon an imperfect and variable contact, as do all systems now in use; and, third, the perfection of a system of selective telegraphy whereby messages may be differentiated and only the receiver that it is desired shall receive the message may become responsive to the waves of ether.

The first of these problems may be said to have been successfully solved, and a transmitter devised capable of radiating all the energy generated. The second is believed to be nearing a successful solution. The third is thought to be well demonstrated theoretically, but has not been fully tested in practice.

While there is much experimental work yet to be done before the present system is reliable for intership communication, or before any two systems can work within the same field without each rendering the other useless, such progress has been made by the Government experimenters that, with no interference by private systems, stations can be successfully operated over at least 150 miles of coast line, and they are now in operation on the North Carolina and Virginia coasts, and soon will be instituted between the Farallone Islands and the mainland and Tatoosh Island and the mainland, on the Pacific coast.

THE MERIT SYSTEM AND THE DISCIPLINE OF THE WEATHER BUREAU.

The merit system of the Weather Bureau conforms to the letter of the Civil-Service law and carries its spirit to a rational and beneficent conclusion. The duties of this Bureau are exacting. It requires a strict discipline to administer a service with such extensive ramifications and have every man at his post of duty at exactly the same moment of time, and to do this several times each twenty-four hours, as is necessary in the gathering and the charting of simultaneous weather observations and in the rapid dissemination back to the country of the forecasts and warnings based upon the observations.

A system of merit and discipline has gradually become fixed in the Bureau. The system is fair. It enables honest and efficient officials to

work themselves upward without placing themselves under obligations to anyone. It contributes to a high standard of manly character and to efficiency in public office.

BUREAU OF ANIMAL INDUSTRY.

Our animal industry, which has been most remarkably developed both as to numbers and values, has experienced great prosperity. There has been an active market for animals and animal products at satisfactory prices. In no other large stock-raising country have animals been so free from disease. It is the function of this Department, through the Bureau of Animal Industry, to foster and assist this branch of agriculture by distributing information, by protecting it from both imported and indigenous contagion, by inspecting animals and meats for the interstate and foreign trade, and by certifying that exported meats are wholesome and that animals are free from contagion.

ANIMAL EXPORTS.

Under this intelligent and helpful supervision there were exported last year animals valued at more than $52,000,000, meats valued at more than $113,000,000, animal fats and oils valued at more than $66,000,000, dairy products valued at nearly $9,500,000, and miscellaneous animal products valued at more than $12,000,000. The grand total of animals and animal products exported during the year amounted to nearly $254,000,000.

INSPECTION SERVICE FOR EXPORT ANIMALS.

Out of a total of 459,000 cattle exported, there were inspected, marked with numbers for identification, and certified 385,000. The remainder were shipped in small lots from ports where no inspection is maintained and to countries which do not require inspection. The number of sheep exported reached about 298,000 head, and of these 228,000 were inspected before shipment. The horses and mules constituted the second largest item in the exports of live animals, the number being 116,500 and the value about $8,900,000. Of these, nearly 48,000 were inspected and certified. There was a notable increase in the number of cattle and sheep exported, the former being greater than any year since 1898 and the latter the largest since 1896. There was a decline in the exports of horses.

The inspection of steamships which is made in connection with the inspection of export animals has been conducted with a view to securing strong and reliable fittings properly fastened to the decks, adequate ventilation, alleyways sufficiently wide to enable attendants to perform their duties in all kinds of weather, and, in general, such arrangements and management as would insure humane treatment and

land our animals in the best condition for market. The percentage of loss in ocean transit has been reduced to 1.72 for horses, 0.91 for sheep, and 0.24 for cattle. During the past year notable improvements have been obtained in the ventilation and width of alleys, and it is believed that the losses have reached almost the lowest attainable point. The number of clearances for vessels which were inspected and passed was nearly 1,000.

INSPECTION SERVICE FOR IMPORT ANIMALS.

In order to prevent the introduction of animal plagues an inspection service is maintained at our principal seaports and along our frontier. Quarantine stations have been established for animals coming from countries where contagious disease exists. There were quarantined at these stations during the year 559 cattle, 525 sheep, 81 swine, and 118 animals for menageries and zoological parks. There were also admitted, after inspection and in some cases quarantine, over 242,000 animals from Canada and about 100,000 from Mexico. The examination of this vast aggregate of imported animals, amounting in all to over a third of a million, is a most responsible task, but so far it has been successfully conducted, and none of the exotic plagues of the domesticated animals has been allowed to reach our territory. With our enormous investment in animals that are susceptible to such plagues, it is clearly a duty which the Government owes to our stock raisers to maintain this inspection and quarantine with the utmost rigidity. The ravages of the rinderpest as it is sweeping over the African Continent should be an object lesson indicating the terrible destruction which such a disease would cause among our immense herds of valuable stock.

The tremendous possibilities of loss from imported contagion suggest that possibly the time has come when it might be well for us to consider whether it would not be best for us to follow the example of Great Britain and exclude entirely live stock from other countries. Inspection and quarantine, however carefully and conscientiously performed, are acknowledged by most countries to be only a relative and not an absolute guaranty of protection. Should not our animal industry have the most complete safeguards thrown around it which the experience of the world has shown to be required for the most absolute and perfect protection? In this connection, we are reminded that some of the territory which has recently come under our flag is believed to be infected with animal plagues and parasites unknown to the United States, and that may work great injury if they are transported to our soil. It would appear to be wise for such legislation to be enacted as would provide against animals from this territory being allowed to enter our ports, whether these animals are brought by individuals or returning troops.

TUBERCULIN TEST FOR IMPORTED CATTLE.

The reported increase of bovine tuberculosis in most countries, and the losses already sustained from the disease in the United States, led me to make an order requiring a tuberculin test of cattle imported for breeding or dairy purposes. The application of this test has detected a sufficient number of diseased animals to fully justify its adoption. In fact, more animals have reacted than was anticipated, and in order to save importers from heavy loss it has been necessary to provide for this test before animals cross the frontier from Canada, and to send an inspector to Great Britain to make the tests and reject affected animals before shipment. In the tests which have been made it is not believed that any animals have been injured by the tuberculin or that any have reacted which were not tuberculous. The welfare of the live-stock interests requires the continuance of this method of inspection.

MEAT INSPECTION.

The meat-inspection service has grown to proportions commensurate with the live-stock industry. It is now maintained in 51 cities and at 156 abattoirs. Nearly 37,000,000 animals were inspected at time of slaughter. This is an increase over the preceding year of 6 cities, 8 abattoirs, and 2,300,000 animals. Although in the aggregate a large number of carcasses were condemned, the percentage has been extremely small. In nearly 5,250,000 cattle inspected the condemned carcasses amounted to only about one-fourth of 1 per cent; in 6,500,000 sheep it was about one-tenth of 1 per cent, and in 24,250,000 hogs it was but one-third of 1 per cent.

The larger part of the inspected meat, as might be anticipated, went into interstate commerce and was consumed in the United States, but there were exported under Department certificates 452,830,373 pounds of beef, 894,648 pounds of mutton, and 231,144,938 pounds of pork. The microscopic inspection of pork was maintained during the year, but owing to the comparatively high prices in this country there was a considerable decrease of exports in this line of products, but 35,942,404 pounds having been certified for countries requiring such inspection.

CONTROL OF INDIGENOUS DISEASES.

There are a few diseases which are more or less distributed over our territory and which require constant supervision and control. One of the most important is Texas or malarial fever of cattle. This disease, owing to the thorough knowledge of it which has been developed by our investigations, no longer has terror for our stockmen. The thorough control now exercised over cattle shipments from the infected area is an almost complete protection, but it must be kept in constant operation to be successful. Nearly 1,500,000 inspections were made

in this service, and 45,400 cars were disinfected. It is hoped through intelligent effort to considerably reduce the area now infected with this contagion.

Much attention has also been given to the repression of scabies in sheep. The number of animals inspected in this service was nearly 8,000,000, and over 1,000,000 were dipped in a proper liquid for the cure or prevention of the disease under the supervision of our inspectors. The effect of the regulations bearing upon this disease has been remarkably beneficial, the number of diseased sheep reaching the markets of the country having been greatly reduced.

One of the most common diseases of cattle is known as blackleg—a malignant and fatal swelling which appears frequently in one of the limbs, causing great discoloration of the affected parts. The only means of combating this disease is by vaccination, and to assist our stock raisers more than one and a half millions of doses of the vaccine have been distributed. This is an increase of more than 50 per cent over the previous year. The demands for this vaccine have been most urgent, and it is evident that its preparation and distribution have been of great benefit. The reports show that the losses have been reduced to less than 1 per cent in affected herds, whereas formerly they were in most cases 10 per cent or more.

Tuberculin and mallein have also been prepared and distributed to State and other local authorities to aid them in detecting tuberculosis in cattle and glanders in horses. The assistance thus rendered has enabled much work to be done locally for the control of these diseases which otherwise would not have been possible. More than 44,400 doses of tuberculin and 7,000 doses of mallein have been thus supplied.

There are several lines of work which might still be taken up with much benefit to stock raisers in certain sections of the country. Cattle for improving the blood of the herds of our Southern States can only be taken there safely after inoculation with the germs of Texas fever. The Missouri Agricultural Experiment Station has had the enterprise to undertake the inoculation of cattle which the breeders of that State desired to ship to the infected area, and the Texas station has also done good work along this line. It was first shown by this Department that such inoculation was a practicable method of prevention, and in the interest of the large section of the South which needs inoculated stock and at present can not obtain it the Bureau of Animal Industry should undertake to thus treat animals which are intended for interstate shipment. There has also been witnessed a considerable outbreak of anthrax in the southern Mississippi Valley, and the Department has been unable to give aid, notwithstanding most urgent appeals. This disease may likewise be prevented by a reliable vaccine, but the facilities and appropriations now available will not permit this work to be undertaken.

PATHOLOGICAL INVESTIGATIONS.

Investigations of numerous diseases have been in progress. Much work has been done with a view to the discovery of some more effectual method of controlling hog cholera than has yet been devised. Tuberculosis has been investigated to learn more about the proportion of affected animals which produce infected milk, and to determine whether bovine tuberculosis is communicable to man. Other interesting and important diseases of horses, cattle, sheep, and poultry have been investigated in order to assist the inspection service in its work or to grant relief in outbreaks to which the attention of the Department has been called. In the treatment and cure of parasitic diseases of sheep and of an eruptive skin disease seriously affecting the heads of these animals, valuable discoveries have been made, which are immediately available for the relief of the sheep industry. Other discoveries as to the nature of several diseases have been made which can not be described at this time.

STATE RESTRICTIONS ON THE INTERSTATE LIVE-STOCK TRAFFIC.

Inspection laws and regulations are enforced in a few States, which duplicate the inspection made by the Bureau of Animal Industry of animals which are shipped from one State to another. In addition to the inspection, some of the States demand inspection fees which constitute a serious burden on this branch of interstate commerce. This inspection and tax is not confined to cattle which are certified by the Federal inspectors and which are destined for the State making the inspection, but in some cases has been applied to animals simply shipped across the territory of a State and destined for some other section of the country. The enforcement of such a policy is contrary to the interests of the country as a whole, and is a reversion to the system of taxing interstate traffic, which became so vexatious in the period before the adoption of our Constitution. If generally sanctioned by the States it would prevent the marketing of live stock from some sections; it would absolutely prohibit shipments across the country, as from Massachusetts to California, and it would destroy much of the usefulness of the Federal inspection and certification, which has become of such value and which has been established by Congress to insure fair treatment and facility of shipment to all sections of the country. So menacing is the present situation to the great cattle industry of the Southwest and West that I have requested the Attorney-General of the United States to cooperate in bringing the matter promptly before the Supreme Court for decision as to the constitutionality of these State laws. It is a matter for congratulation that this request has been favorably received and that the assistance of the Department of Justice is promised, with a view to obtaining an early adjustment of this serious question.

BUREAU OF PLANT INDUSTRY.

The Bureau of Plant Industry was one of four Bureaus organized during the year in accordance with an act of the last Congress. The advantages of bringing together the allied lines of work in the Department were pointed out in my last report, and already good results have been secured by following the policy there laid down. Congress authorized the bringing together of the plant physiological and pathological investigations, the botanical investigations, the grass and forage plant investigations, the work on pomology, and the experimental gardens and grounds; and during the year the Arlington experimental farm, the investigations in the production of domestic tea, the work on foreign seed and plant introduction, and the Congressional seed distribution have been added by executive order, making nine branches in all. The unification of work and the advantages resulting from close cooperation and perfect elasticity to all branches composing the Bureau as at present organized prompt me to urge that Congress take proper action toward broadening all lines, as provided for in the estimates for the next fiscal year. As at present constituted the Bureau has a corps of more than 200 efficient workers, and nowhere else in the world are so many important plant problems being studied. The past year has been marked by important advances along many lines, a few of which may be noted here.

PLANT PHYSIOLOGY AND PATHOLOGY.

The field of plant physiology and pathology is an exceedingly broad one, involving, as it does, a study of normal plant life on the one hand, and abnormal conditions on the other. Although this work is comparatively new, its advances have been rapid, especially during the past three or four years, largely as a result of the work done by the Department. The great aim of all this work is to make it reach the farmer, and to do this it is essential that the practical features should always be kept in mind. Following are some of the practical results obtained in the past year, showing the bearing of this work:

WORK ON COTTON DISEASES.

Cotton is subject to many serious diseases, some of which cause immense annual losses. These losses are not evenly divided, but fall with crushing effect upon individual growers and communities. In the sea-island region, where the fine grades of sea-island cotton are produced, hundreds of acres, including many fine farms, have been rendered worthless for cotton by a disease known as wilt. This is due to a fungus parasite in the soil, which for several years has been spreading slowly but surely throughout the cotton areas of the Southeast. Every attempt to kill this fungus in the old way, by treating

the soil and plants with fungicides, failed, hence attention was turned to the problem of obtaining a form of cotton which, through its own inherent vitality, would be able to resist the disease. The clew to this had already been noted in the fact that individual stalks here and there in a field of cotton would resist the attack, and this suggested the plan of selecting seed from such resistant stalks, thus gradually securing a form which would be immune. This has been accomplished, and it is planned to extend the planting of the resistant sorts as rapidly as the work can be pushed.

In this connection, another interesting and valuable discovery has been made in the matter of securing also a resistant cowpea. The cowpea is used in rotation with cotton, and it was also attacked and killed by the same fungus which destroyed the cotton roots. The securing of a resistant cowpea will make it possible for the growers of the fine sea-island cotton to bring back their land to its once high value.

DISEASES OF ORCHARD FRUITS.

The peach in this country has generally been a very profitable crop, but for many years it has been subject to a number of serious diseases. Some of these can now be controlled, notably "yellows" and peach-leaf curl, two of the worst enemies of peach growers. A few years ago a new disease appeared in some of the finest peach orchards of New York, Michigan, and other States, and this trouble has caused growers a great deal of uneasiness. The Department has had one of its most competent experts engaged on the disease, and he believes that he has discovered the cause. The disease in question is known as "little peach," from the fact that the fruit ripens when very small, this symptom becoming more pronounced each year until the tree dies, which it invariably does at the end of two or three years. The cause of "little peach" is believed to be a fungus which attacks the very young roots, and already the matter of preventing it by securing resistant stocks has been taken up.

DISEASES OF FOREST AND CONSTRUCTION TIMBER.

The losses due to the rotting of forest timber and timber used for construction material, such as railroad ties, bridge sills, etc., have been great, and an increasing demand has been made for information that would lead to more light as to the best methods of preventing such losses. During the year a thorough investigation of this subject was inaugurated, the work being undertaken in cooperation with the Bureau of Forestry. An expert was sent to Europe to secure information as to the methods employed in controlling timber rots there, and extensive experiments were inaugurated to determine the best methods of preserving construction material and the prevention of diseases in standing timber.

PLANT-BREEDING WORK.

The breeding of plants for the purpose of obtaining forms resistant to disease and better adapted to the new and changed conditions which are constantly arising is rapidly becoming an essential feature in agriculture. Attention has already been called to the work of securing strains of cotton resistant to wilt and other diseases. The remarkable success of these experiments indicates the importance of this phase of plant-breeding work. Some new strains of upland cotton were also secured by hybridizing the short and long staple cottons. One of these hybrids in particular is said by experts to be superior to any upland cotton now grown. Numerous other valuable hybrids and select strains have been developed, and these are being tested and their characteristics fixed. A hybrid between one of our American upland cottons and an Egyptian variety promises to be greatly superior to either parent.

For several years the Department has been working to secure, by breeding, a race of oranges resistant to frost. It was proposed by this means to restore the orange groves of Florida, which formerly produced several million dollars' worth of oranges yearly, but were nearly all destroyed by cold a few years ago. Twelve of the new evergreen hybrid oranges, secured as a result of crossing the hardy Japanese form with the Florida sweet orange, have proved to be the hardiest evergreen oranges known in the world. Southern nurserymen have pronounced them to be of great value as hedge plants, entirely apart from their fruit-bearing value. There is great promise, however, that we will ultimately secure a fruit that is hardy and of good quality. Some of the hybrid raisin grapes, produced with a view of securing resistance to a disease known as "coulure," or dropping of the fruit, have borne for the first time. These vines have proved hardy so far and have produced fruit of remarkably fine quality. Some of the vines appear to be resistant to a serious and destructive root disease which has appeared in California, and they may resist the worst of all Pacific coast grape diseases—the so-called "California vine disease."

A serious problem which for many years has confronted the farmers of the West is the securing of plants resistant to the alkali soils of that region. Wherever agricultural crops are being grown there has been more or less adaptability of plants to the peculiar conditions existing in many parts of our Western country, and as a result some plants are found to give much better yields on certain soils than others, mainly through their ability to resist the large amount of alkali present. In connection with the breeding work important investigations have been inaugurated looking to the development of resistant plants of many kinds, special attention being given to the forage crops, as these are of great importance. In this connection cooperation has been secured with the Bureau of Soils, whose work during

the past few years in the West has brought about a much better understanding of some of the important questions concerning the agricultural development of that region. Other important lines of work in the matter of plant breeding have to do with cereal improvement, but these will be more fully discussed under "Introduction of seeds and plants."

NITROGEN-GATHERING BACTERIA.

Nitrogen is one of the most costly and probably the most important of all plant foods. So valuable is this material and such is the demand for it that already it has been predicted that it is only a question of a few years until the commercial supply will be exhausted. Recently, however, attention has been turned to the bacteria which develop nitrogen in connection with the roots of clover, beans, and many related crops. A new method of cultivating and obtaining these organisms in large quantities for distribution with leguminous seeds has been discovered, and will be perfected and put into practical use during the coming year. This, it is believed, will make it practicable to grow many leguminous crops where, owing to the lack of proper organisms, they have refused to grow in the past. It will also make practicable the use of a large number of legumes for gathering nitrogen.

BOTANICAL INVESTIGATIONS AND EXPERIMENTS.

The botanical investigations and experiments conducted by the Department have led to many valuable discoveries, and from year to year their great practical value is being recognized more and more. The work being done on seeds, improvement of crops and methods of crop production in our tropical possessions, and prevention of the great losses of cattle in the West through the eating of poisonous plants is of special interest. The following are some of the more striking results of the work done under this head during the past year:

NEW FACTS CONCERNING KENTUCKY BLUE-GRASS SEED.

The Department of Agriculture has for a number of years past purchased considerable quantities of Kentucky blue-grass seed for Congressional distribution. Since the practice was inaugurated of making germination tests of all the seeds distributed it has been found that Kentucky blue-grass seed, as offered in the open market, could not be secured ordinarily of a higher germination than 50 to 60 per cent. On the other hand, it was found possible, by special purchase, to secure seed showing a germination of 90 per cent and more. These facts suggested an investigation of the causes of the low germination of ordinary commercial samples. It has been found that in harvesting this seed the tops of the grass are stripped from the growing plants

when green and piled in windrows. In this stage, unless great care is taken in turning and airing the mass, a heating takes place in which the temperature rises sometimes as high as 173° F. The tendency of this heating is to destroy the germination of the seed. This fact is readily applied, even under the methods of handling the grass seed which are now followed in the areas where it is grown. In order, however, to secure the most practical results, the Department is now engaged in experimenting with machinery which will dry the moist seed without permitting it to heat, and at the same time without destroying its germination in any other way. There is good prospect that suitable machinery will be found.

SECURING A STAND OF BERMUDA GRASS FROM SEED.

One of the most valuable pasture grasses for use in the Southern States is Bermuda grass, a species of tropical origin. In our latitude this grass seeds very sparingly, and the method of securing a field of it has been to transplant roots. This method, however, is so expensive as to be almost prohibitory. Experiments have been made with good imported seed by the Department during the past two years on the tria grounds at Washington, and it has been found that when sown at the rate of 3 pounds per acre during a portion of the year in which the ground continued moist, a good stand from 3 to 6 inches high was secured in forty-five days. The procuring of good germinable seed and the adaptation of the above facts to conditions in the South should make it possible to secure at a moderate price an excellent stand of this valuable grass.

SUPERIORITY OF AMERICAN-GROWN CLOVER SEED.

Owing to a controversy in Europe regarding the relative value of American and European clover seed, the Department has undertaken some comparative experiments, the initial series of which was conducted at Washington. Many samples of clover seed of known origin from the different countries of Europe and from different parts of the United States and Canada were grown under like conditions. Cuttings of hay were made at suitable intervals, the product of each plat being carefully weighed. These experiments, which have now been under way for two years, show conclusively that under the conditions existing here the European red clover is decidedly inferior in productiveness to the American. Apparently the American strain is better adapted to the conditions of bright sunshine, periodic heat, and dryness that exist here. For the purposes of our farmers, therefore, a decision of the question whether to use American or imported seed is easily reached. During the past year a series of supplementary experiments has been started at typical selected areas in different parts of the United States, to see whether these results hold in the principal clover-growing States.

A REMEDY FOR STOCK POISONING.

The loss of stock in Montana, caused by poisonous plants, has been estimated at from fifty to one hundred thousand dollars per annum. Prior to the present fiscal year there was no simple and reliable way of saving stock when poisoned, but now, by a series of careful experiments conducted at the request of the Montana authorities, the Department has shown that if a small tablet consisting of permanganate of potash and sulphate of aluminum be promptly administered the greater part of this loss can be averted. The action of the permanganate is to oxidize and destroy the poison still remaining unabsorbed in the stomach, and this action is intensified by the sulphate of aluminum. The poisonous plants that respond to this treatment are, so far as ascertained, larkspur and poison camas, the two plants that cause most of the losses in Montana.

STUDIES OF AMERICAN FIBER PLANTS.

The Department's work with Egyptian cotton, outlined in my previous report, has produced very encouraging results, and it is now believed that it can be successfully grown in this country. As early as 1892 the Department imported and distributed seed of some of the choice Egyptian sorts, but owing to lack of money the matter was not followed up. Recently, however, considerable seed has been imported, and the outlook for the growth of this cotton is much more encouraging. Additional facts in regard to what has been accomplished in this line will be given under "Introduction of seeds and plants from foreign countries." Some very encouraging results have also been obtained through our studies of hemp, especially in regard to imported kinds, and particularly those from Japan.

TROPICAL AGRICULTURE.

The acquisition of tropical territory by the United States has made it important and necessary that the Department become thoroughly familiar with the agricultural conditions prevailing in these lands, and their possibilities in crop production, (1) for the purpose of supporting the present population; (2) for supporting the population which will result from the new and changed conditions, and (3) for bringing in revenue from outside sources. The United States pays out millions of dollars annually for tropical products which we ought to grow, and which we can grow without interfering in any way with well-established industries. Coffee, rubber, bananas, cacao, and many other tropical crops not hitherto grown by us can now be produced, and attention has been turned to the best methods of succeeding with such crops.

It is evident that for many years the Department will have to keep in close touch with whatever work may be inaugurated in these outly-

ing lands; hence, experiment stations established there must be so organized as to be an integral part of the Department. In order to do this the stations should be put in charge of men from the Department who are familiar with existing conditions and whose knowledge will render them strong supporters of the Department's work. This policy has already been carried out in the case of the stations established in Hawaii and Porto Rico. The tropical work proper of the Department, therefore, will be along the lines already laid down, and wherever practicable will be carried on in cooperation with the stations established, whose energies, for a number of years at least, must be devoted to matters more or less local.

The improvements in the coffee industry of Porto Rico are an example of what has already been accomplished in this direction. Among the agricultural imports of the United States, coffee is second only to sugar, our annual importations averaging $70,000,000, and only a small fraction of 1 per cent of this quantity comes from our tropical islands. The most important industry of Porto Rico, however, is the raising of coffee for European markets; hence, it has received early attention in our investigations of tropical agriculture. It has been found that the Porto Rican coffee plantations are seriously injured by being too heavily shaded, and also that shade is not, as commonly believed, a necessity, the supposed good effects resulting from it consisting simply in the fixation of nitrogen in the soil by the root tubercles of the leguminous trees used for shade. The other advantages of shade are only indirect, consisting in the protection of the soil from heat, drought, and erosion. Rational moderation in the use of shade, the raising of seedlings in nurseries, and other practical cultural improvements would double or treble the island's output of coffee, and with the increase of acreage readily possible for this crop the island could be made to produce more than half of the coffee consumed in the United States. The work now under way is planned to bring this about, and encouraging results have already been obtained.

GRASS AND FORAGE PLANT INVESTIGATIONS.

The problems involved in the investigations of grass and forage crops are some of the most important that to-day confront the American farmer. As population increases and competition in all lines of agricultural work becomes keener, the need becomes strongly felt for more light on such important questions as: How to restore the great ranges of the West; how to maintain our pastures; how to meet the trying conditions in the South and semiarid West in supplying food for stock, etc. The work of the Agrostologist is conducted with a view to solving these problems, and already very encouraging and promising results have been obtained, some of which may be referred to here.

RANGE IMPROVEMENT.

The loss to the cattle interests of the West during the past fifteen or twenty years, as a result of injudicious management of ranges, has been heavy. In order to obtain some information as to the possibility of restoring these overstocked lands, experiments in regrassing were undertaken at Tucson, Ariz., in cooperation with the agricultural experiment station, and at Abilene, Tex., with Mr. H. L. Bentley, employed by the Department for this work and living at that place. At Tucson a small area of land was secured for the experiments, the ground having been previously denuded of grass through overstocking and mismanagement. Very promising results have already been obtained in connection with this work, it having been shown that by comparatively simple and inexpensive methods much can be done toward bringing the ranges back to their original condition. The experiments at Abilene, a report on which has been prepared, have demonstrated conclusively the possibility of greatly improving the cattle ranges by practical methods and at comparatively little cost, the stock-carrying capacity of the range lands selected for the experiments being doubled in three years. Mr. Bentley claims that it is not only possible to restore the worn-out and grass-denuded ranges to their former productiveness, but that while this is being done cattle may be pastured on them and the number increased from year to year as the capacity of the pastures to sustain them is increased.

Widespread interest in this work has been aroused, and so great has been the demand for its extension that an estimate for additional appropriations to carry on the investigations has been made. I earnestly recommend that the increase asked for be granted, and, furthermore, that action be taken by Congress giving you, Mr. President, authority to secure for the experimental needs of this Department such tracts of public range lands as may be necessary for the best interests of the work.

GRASS GARDENS.

Nothing is more instructive to visitors than to see grasses and forage plants growing, and for this reason considerable time has been devoted to developing the gardens at Washington, and at Buffalo in connection with the Pan-American Exposition. In these gardens the cultivation of ornamental grasses and of grasses suitable to lawns was specially undertaken for the information and guidance of those interested in beautifying the home. More than 300 varieties of grasses and forage plants have been brought together in the gardens at Washington, and many interesting and valuable results have been obtained through a study of their behavior under the conditions of climate and soil prevailing here. A feature of the Pan-American Exposition was the Department's exhibit of growing grasses and forage plants. This exhibit was located near the Government building and attracted wide-

spread interest and attention from the first. As the season advanced and the characteristics of the different grasses became manifest, dairymen and farmers from all sections of the country visited the plots and were much interested in the object lessons they taught.

A unique feature of this exhibit was a display of the sand-binding grasses, the object of this being to illustrate how vast tracts of land along our seacoast may be made profitable at comparatively small expense. A miniature sand dune was produced artificially, and on it were planted the common beach grass of the Atlantic coast north of Virginia, sand millet of the coast of Virginia southward, the sea lyme grass from the coast of Oregon, long-leafed sand grass from the lake shores, and other sand-binding types. Naturally these grasses are never found except in drifting sands, for the fixing of which they are well adapted. Altogether this work has done much to show in an instructive way many interesting features of the grass and forage plant investigations.

COOPERATIVE WORK WITH EXPERIMENT STATIONS.

Another important feature of the work of the Agrostologist during the year was the formulation of a plan for conducting experiments with grasses and forage plants in cooperation with the experiment stations. Formal articles of agreement, setting forth the objects of the experiments, the respective features of the work to be assumed by each party to the agreement, and the manner in which the results obtained may be used by each, were drawn up and the agreement signed by the proper officials of the Department and the stations. In some cases the Department assumed a part of the expenses connected with the experiments, while in others it simply furnished the necessary seed and expert services in preparing the plans.

In arranging for the work care was exercised in each case to select a station in the locality where the solution of the particular problem to be taken up seemed most important, and where the best facilities were provided. The plans have met with general approval, and already cooperative experiments are being conducted with 13 stations. The problems taken up have widespread application, and the results so far obtained lead to the belief that great good is to come from the work as a whole.

POMOLOGICAL INVESTIGATIONS.

The fruit interests of this country have grown to enormous proportions, and the pomological work of the Department is designed to promote them in every way possible. With this end in view, a large exhibit was last year maintained at the Paris Exposition, the object being chiefly to encourage a demand for American products. The beneficial effects of this work are already showing in the increased demand for American fruits, especially oranges and apples. In 1899

the United States exported 380,222 barrels of apples, valued at $1,210,459. In 1900 526,636 barrels were exported, valued at $1,446,555. Already in 1901 855,673 barrels have been exported, valued at $2,058,964. The value of the oranges exported in 1901 is double that of 1900, all of which can largely be traced to the interest aroused by the work at Paris.

EXTENSION OF FRUIT MARKETS.

In order to open up additional markets for our fruit and to bring about better methods of harvesting, packing, storing, and shipping the same, a small fund was secured for the present fiscal year, and the results accomplished with this encourage the belief that there are great possibilities for trade in American fruit abroad. Trial shipments of pears, peaches, and other fruits have been inaugurated with such encouraging results that it is believed the work will be undertaken next year on a commercial scale by private interests. With the unrivaled facilities America possesses for growing the finest fruits, and with a clear understanding as to the proper methods of handling, there is no reason why a fine foreign trade should not be developed.

ENCOURAGING THE PRUNE INDUSTRY OF THE PACIFIC COAST.

The prune industry of the Western States has grown to large proportions, but in order to compete with foreign trade the need has long been felt for a better knowledge of methods of growing and handling the crop and the best varieties to plant. By an arrangement between the Pomologist and the Botanist an agent was sent during the year to France to study the prune industry there. The work of this agent resulted in the discovery and introduction of several important varieties that promise to be of value in the Pacific Northwest.

GROWING EUROPEAN GRAPES IN THE SOUTH.

The United States imports every year large quantities of European grapes, which are sold mostly for table use. It was believed that some of these varieties could be grown in the South, and to test the matter a number of plantings were made there three years ago. These grapes fruited one year ago, and the indications are that some of the varieties will be found valuable for our markets.

EXPERIMENTAL GARDENS AND GROUNDS.

Under the new arrangement through which the experimental gardens and grounds become a part of the Bureau of Plant Industry, plans have been made for using them in connection with nearly all lines of work. The greenhouses and conservatories prove valuable for the propagation of many useful plants secured by the agricultural explorers and others. Much has been done during the year toward

increasing the valuable collections already on the grounds and propagating and disseminating to nearly all parts of the country rare forms which have proved valuable. A part of the force of the gardens has been employed in gathering seeds of rare trees and other plants, and from them growing seedlings for distribution. The cultivation of plants under glass is rapidly assuming important proportions, many millions of dollars being annually invested in this work. There has long been felt the need of careful experiments to determine methods of growing such crops and improving them. To this phase of work special attention has been devoted, and already promising results have been obtained.

THE ARLINGTON FARM.

This farm, which was placed at the disposal of the Department two years ago, consists of about 400 acres of rolling land, and, as a whole, is very well suited for the purposes set forth in the act. The appropriation available has been devoted to getting the ground into shape, and already marked improvements can be noted. A large part of the preliminary rough work, such as clearing, draining, etc., has been accomplished, and the general plan of getting the land into condition for planting, preparatory to inaugurating experiments, has been perfected. The farm can be made a valuable adjunct of the Department, and will be so managed as to give opportunity for conducting practical experiments in many lines of work. The shaping of a general plan with this object in view is necessarily slow, as each step must be carefully considered. Buildings will soon be needed, and recommendations have been made to this end.

PRODUCTION OF TEA IN THE UNITED STATES.

The production of several kinds of tea in the United States is now an assured fact, and in addition to this it is encouraging to be able to announce that experts who have examined the tea produced here this year pronounce it equal in flavor and aroma to the best imported teas. As pointed out in my previous report, the profit in this crop averages from $30 to $40 per acre net. During the year Dr. Charles U. Shepard, of Summerville, S. C., has been in charge of the Government work, conducting it in connection with his large tea gardens at the place mentioned. This year Dr. Shepard produced about 4,500 pounds of high-grade tea, for all of which a ready market was found in the North. During the year Dr. Shepard perfected a machine for the manufacture of green tea, and has very generously placed this under the control of the Department, so that those wishing to use it may do so without paying royalty.

Capital is always timid of investments in new enterprises of this kind, and there is still much to be done to demonstrate the possibil

ities of the work in other parts of the South. The labor problem is an important one, but Dr. Shepard has shown his ability to handle it, and with his aid the Department is now training a few young men in the technique of the work. The extension of the industry in the South and studies for the purpose of improving the quality of tea will be pushed as rapidly as the moneys at hand will permit. There are thousands of acres of land and thousands of idle hands that might be made available for this work, and our possibilities in this field should not be neglected. The United States imports from $10,000,000 to $12,000,000 worth of tea every year, and, although it may be a long time before anything like that amount can be produced in this country, the industry should be encouraged in every possible way.

INTRODUCTION OF SEEDS AND PLANTS FROM FOREIGN COUNTRIES.

The act of Congress establishing the Department of Agriculture specifically provides for the introduction and dissemination of rare and valuable seeds. More or less of this work has been carried on for forty years, but recognizing the needs for enlarged and systematic efforts along this line, steps were taken three years ago which led to a great increase in the Department's opportunities in this direction. Briefly stated, the object of this work is to encourage the building up of home industries and thus save the American people large amounts annually sent abroad. With our vast resources and variety of climate and soil, and a people who are never daunted by the difficulty of an undertaking, the possibilities of developing new fields seem unlimited. In probably no branch of the Department's work can the practical value of its efforts be more quickly shown than in this line. Some of the results achieved the past year are set forth below, and a study of these will show in what manner new industries may be developed.

DEVELOPMENT OF THE RICE INDUSTRY.

In my last report attention was called to the fact that the introduction of Japanese rice resulted in an increased production, amounting to at least $1,000,000, of this commodity in Louisiana, and furthermore, that the impetus given to the work in Louisiana and Texas led to the investment of not less than $20,000,000 in the industry. In 1900 about 8,000,000 pounds more rice were produced than in 1899, and this year 65,000,000 pounds more were produced than in 1900. With the rapid increase in our own production the importation of rice from foreign countries is falling off, as shown by the fact that in three years the imports have decreased from 154,000,000 pounds to 73,000,000 pounds. All the increase in home production can not, of course, be ascribed to the Department's introduction and distribution of Japanese rice, but the great impetus to its production in this country was

given by the Department's introduction three years ago. Evidently it will be but a few years until the United States will not only grow all the rice consumed here, but will export part of the product as well.

MACARONI WHEATS.

The United States imports over 16,000,000 pounds, nearly $800,000 worth, of macaroni annually. This product is made from a special class of wheats, which, until recently, had never been given a thorough trial in this country. The Department secured a quantity of the wheats, and it has been found that they are well adapted to a wide extent of territory in the West and Northwest. During the last two years they yielded one-third to one-half more per acre than any other wheats grown side by side with them, and in 1900, when other wheats were almost a complete failure in the Dakotas, the macaroni varieties produced a very good yield, and the grain was of excellent quality. They have also been very successfully grown in Kansas and Nebraska. The results of last season's work show also that a high quality of grain of this class can be produced.

The Department has made every effort to bring the producers and buyers of this class of wheat together, with the result that the demand for it now more than equals the supply. Moreover, certain companies are now for the first time offering for macaroni wheats, which include the well-known Wild Goose that was heretofore invariably rejected in the markets, about the same price as is paid for No. 2 Northern. There is a demand for carload lots of macaroni wheat for seed as well as for milling. Our own factories for making macaroni are awakening to the importance of using these special wheats instead of the ordinary bread wheats, and the demand for macaroni flour for this purpose is already greatly in excess of the supply. Besides the home demand for these wheats there is a good market abroad.

The building up of the macaroni industry, which has been carried on as a part of the pathological and physiological investigations, shows the importance of concentration of effort on a single crop. With the factories ready to take the wheat and to make from it macaroni equal to the foreign article, it will not be long before the $800,000 sent abroad can be kept at home.

NEW FORAGE CROPS.

For many years there has been an urgent demand for some good grasses and forage plants for the States of the Great Plains, especially for the Northern States, where the winters are so cold and dry that ordinary forage plants are killed out. This demand has been met to a great extent by the importation of the smooth brome grass (*Bromus inermis*), as stated in last year's report. This grass comes from

Russia and Hungary, and has proved to be most excellent for pasture and hay, being perfectly hardy as far north as North Dakota. A hardy alfalfa imported from Turkestan has also proved valuable, being far more resistant to cold and drought than those ordinarily grown and which came originally from much less rigorous climates.

HOPS AND BARLEY.

Although hops have been grown in this country for a great many years, they have always been inferior as compared with the best European hops, and as they bring a lower price in the market and are not so desirable as the Bavarian hops, cuttings of the best of the latter were imported last year. These cuttings have been placed in the hop-growing districts of the United States, and promise to be far superior to the ordinary varieties grown, in addition to maturing earlier and extending the picking season.

American barleys are also inferior to the Bavarian barleys, being too nitrogenous and not sufficiently starchy. The ordinary varieties grown in America are the six-rowed and the four-rowed kinds. The two-rowed kinds of Europe are superior for some uses. The Department therefore imported last year for experimental purposes, in addition to the hops, a quantity of the best Bavarian barleys, and these are now being tried in this country. It is hoped that by growing this improved barley, as well as the superior varieties of hops, the importation of large quantities of some articles of commerce will be done away with.

AMERICAN-GROWN EGYPTIAN COTTON.

Approximately $8,000,000 worth of Egyptian cotton is imported into this country every year, there being a special demand for this cotton on account of its high quality. The Department imported some seed of this cotton several years ago, but more recently larger quantities were obtained and placed where the variety seems likely to succeed. Very encouraging results have been obtained from the work, and this year a bale of Egyptian cotton, grown from imported seed in southern Georgia, was given a thorough spinning test in a mill in Connecticut, and was pronounced equal to the best imported grades. It is believed that we can grow this crop, but aside from this the cottons themselves will be valuable in breeding forms, which in all probability will prove better than their parents.

AMERICAN DATES.

Another importation which will probably in time prove of great value to the southwestern part of the country is that of date palms obtained in Africa. A number of years ago a limited importation of these palms was made from Egypt, and, while most of them were lost through adversity of climate, the shipment helped to show the possi-

bilities of date growing in Arizona and southern California. Through agents of the Department a small shipment of date palms was secured from Algeria in 1899, and a large shipment from the same country, mostly from the borders of the Sahara Desert, in 1900, and fully 90 per cent of these are growing vigorously. This year a collection of the choicest varieties in Egypt has been obtained and sent to the Southwest, this importation being in continuation of the plan to obtain from every part of the world where the date palm is grown a complete collection of the choice varieties.

The date palm is of special value in the hot Southwestern country, since it thrives and fruits best where the summers are long and hot, as in Arizona and California. The establishment of the industry in this section, therefore, would make it possible to utilize much of the land there which, though irrigable, is too alkaline for ordinary crops. It is hoped, now that a large number of plants of the choicest varieties have been imported, that in time this country may produce enough dates to supply the home demand and, perhaps, even some for export.

CONGRESSIONAL SEED DISTRIBUTION.

Congress has assigned to this Department the duty of purchasing and distributing seeds and plants, and in order that there may be no question as to how and when this shall be done, the law in regard to it is made very specific. I have endeavored to meet the wishes of Congress in this matter in every way possible, and to the best of my ability have secured seeds of as high character as could be obtained under the conditions under which we work. Notwithstanding all precautions, however, the system of securing seeds through a contractor is apt to cause trouble, not so much on account of the likelihood of having inferior seed furnished, as of the contractor's inability to furnish the varieties called for, owing to the quantity required. This was especially the case the past year, and so many complaints were received in regard to this and other points pertaining to the work that I ordered a thorough investigation by the Chief of the Bureau of Plant Industry, in whose charge the entire matter has been placed. No settlement has as yet been made with the contractor for last year's seed, and none will be made until every requirement of the contract has been fulfilled. No matter what the issue, the Department is fully protected on every point.

Although the amount to be expended for seed for the forthcoming distribution is double what it was last year, the work has been so systematized that no apprehension is felt as to our ability to send out all seeds on time. As soon as it was known how much would be available for the work, immediate steps were taken to get all the preliminaries arranged, and as a result the schedule, which provides that the distribution shall begin December 1 and end March 1, will be carried out to the letter.

In the distribution of the vegetable seed through a contractor three important essentials are provided for; that is, (1) the seeds must be true to name; (2) they must have a high vitality, and (3) they must be free from mechanical impurities. The scientific staff of the Bureau of Plant Industry is charged with the important duty of seeing that these conditions are complied with, and for every failure the contractor must abide the consequences.

In order to increase the value of the work, several changes have been made, which may be briefly referred to here. It has been arranged to send out the cotton seed, tobacco seed, sorghum seed, and sugar-beet seed, and the grasses and forage plants under the direct auspices of the officers of the Department and not through a contractor. By following this plan we have been able to adopt a number of innovations which it is believed will add greatly to the value of the work. The cotton seed, for example, will be selected from high-yielding and comparatively new sorts. The Department has been working for several years improving cottons by breeding and selection, and gradually the seed of these new forms will be worked into the distribution. Furthermore, the adaptation of certain varieties to peculiar conditions of soil and climate will be considered, and this, together with the gradual extension of better grades, will, it is believed, do much to improve the cotton industry in the South. Tobacco seed will be handled in very much the same way as the cotton seed, selected seed being used and varieties sent into districts where the conditions of soil and climate are favorable for their highest development.

With the grasses and forage plants the object will be to demonstrate what varieties are of special promise for different regions, and to this end the country will be properly districted and such seed sent into each district as the experience gained through the work of the scientific branches of the Department may suggest.

It has long been my belief that much good might be accomplished by using a part of the appropriation in a judicious dissemination of some of the more valuable trees. Plans have therefore been made to place at the disposal of each Senator, Member, and Delegate in Congress a limited number of selected trees, the object being to encourage a love for tree planting and all that this work involves. It will, of course, be entirely beyond the scope of the Department to send a large number of trees to any one place, but it is believed that the action contemplated will eventually lead to extensive planting through the educational effects of the work. Commercial establishments are well prepared to supply trees in nearly all parts of the country at reasonable cost, and the plan of our work will, it is believed, eventually advance their interests. Already there has been secured for distribution a choice collection of nut trees, principally pecans, and these are

being grown by the Department from nuts gathered from selected trees in all parts of the country.

It is believed that some such plan as outlined for the distribution of the special crops mentioned above can be applied also to the general distribution of vegetable and flower seeds. It will certainly be an advantage to intelligently district the country and send into each district only such seeds as are likely to improve its conditions. This will obviate the necessity of having to secure such immense quantities of single varieties, a task which is often difficult to perform. It will furthermore enable the Department to gradually introduce into the distribution rarer sorts, and to drop these after the first year or two, leaving the demand for them to be supplied by the trade. When the Department has secured the seeds and plants which it is believed are best adapted to certain districts, its responsibility, to a certain extent, ends, as it looks to Senators and Members of Congress to place them in the hands of such of their constituents as in their judgment will make the best use of them. Due notice, however, will always be given of every special distribution, and in addition all information that the Department possesses will be furnished, so that the recipients may act intelligently in handling whatever may be sent out. Carrying out the work as here outlined it is believed will result in good to the entire country, as is the intent of the existing law.

BUREAU OF SOILS.

The Division of Soils was organized in the Weather Bureau in 1894 by Executive order. In 1895 it became an independent division in the Department, with an appropriation of $15,000. In 1899 the functions were enlarged to include the mapping of tobacco soils and other necessary tobacco investigations, with a total appropriation of $26,300. In 1900 the appropriation was increased to $31,300. In the act approved March 2, 1901, the Division was reorganized into a bureau, with an appropriation of $109,140, and in joint resolution No. 8 of the same Congress provision was made for the printing annually of 17,000 copies of the Fie'd Operations of the (then) Division, at an estimated cost of $20,000; 3,000 to be distributed by the Senate, 6,000 by the House, and 8,000 by the Department.

This remarkably rapid evolution of the soil work of the Department from a subordinate division of the Weather Bureau to a bureau organization of its own, within a period of six years from its inception, is based wholly upon the economic importance and value of the work, the careful and conscientious administration of its affairs, and a thorough understanding and appreciation of its aims by the people upon which the liberal support accorded by Congress has been granted.

The Bureau of Soils is charged with the study of soil problems in

their relation to practical agriculture; with the investigation of the physical and chemical properties of soils and of the materials and methods involved in artificial fertilization and its influence upon the original soils; with the classification and mapping of soils in agricultural districts to show the distribution of the various soil types, with a view to determining their adaptability to certain crops, and their management and treatment; with the investigation of alkali problems and their relations to irrigation and seepage waters, the causes of the rise and accumulation of alkali, and the reclamation of injured or abandoned lands; with the investigation of tobacco soils and the methods of cultivation and of curing, with especial reference to fermentation; the introduction, through selection and breeding, of improved varieties into the principal tobacco districts of the United States, and to secure as far as may be possible a change in the methods of supplying tobacco to foreign countries.

The reorganization of this Division into a Bureau of Soils, with a large increase of funds and a corresponding enlargement of the opportunities for work, went into effect on July 1, 1901; but $10,000 had been made immediately available, and the gradual adoption of the plans of reorganization occupied fully six months of the fiscal year for which this report is intended. The reorganization was based upon the following facts:

In my last report I called attention to the great demand for the soil survey and mapping of soil areas throughout the country and the consequent need of a much larger appropriation. At that time the Division of Soils had made detailed maps of 3,386 square miles, or 2,160,000 acres, a part of which had been published, on a scale of 1 inch to the mile. This work had covered portions of Maryland, Connecticut, Pennsylvania, Louisiana, Utah, California, and Arizona. The Maryland work showed a variety of soils in southern Maryland and the Eastern Shore adapted to a number of special lines of agriculture, including truck farming, fruit growing, special types of tobacco, and general farming, and gave a basis for the specializing of crops and agricultural interests and improved methods of treating the soil, which give promise, if carried out, of important developments in that section. The work in Connecticut had pointed out the possibilities of growing the Sumatra tobacco and of building up a very profitable industry in the raising of this fine type of wrapper leaf. The possibility of this has since been shown in the production of a small crop of very desirable wrapper leaf last year and the growing during the present season of about 43 acres of Sumatra tobacco which promises very well, and which indicates to the tobacco men that the $6,000,000 worth of tobacco which we annually import can be as well produced in Florida and in the Connecticut Valley, with large profits to our own growers.

Equally significant results are looked for in the introduction of Havana tobacco into the tobacco districts of Pennsylvania, Ohio, and Texas, and there was a great demand from these States to map the soils and investigate the possibilities of introducing new varieties of tobacco which would bring a higher market price and would tend to diminish the imports of the finer qualities of filler tobacco.

There was a strong demand from the fruit growers for the preparation of maps showing the distribution of the important fruit lands, particularly of the mountain areas in the Atlantic Coast States. The success of the mountain peaches in western Maryland and of the pippin and other varieties of apples in the mountains of Virginia and North Carolina, and the experience that these were successful only on certain types of soil, made it appear that a detailed soil map would be advantageous and would tend to prevent costly experiments on soils which years of experience might show unsuited to the crop.

The important commercial development of the sugar-beet industry and the large investments necessary in the establishment of sugar factories have created considerable interest and wide demand for soil-survey work in order to locate the best sugar-beet soils where climatic and other conditions were supposed to be favorable for the building up of this industry. The director of the Arizona Experiment Station reported that the sugar content in pounds per acre from five characteristic soils of that Territory ranged from 1,491 to 3,361 pounds, the intermediate yields being 1,521, 2,006, and 2,267 pounds, and declared that it was exceedingly desirable to have the soil outlined that gave the largest yields of sugar. Urgent requests on similar lines came from important sugar-beet areas of the southern and central coast regions of California and from those of New York and Michigan, as well as other States. With the training and experience of our field men the soils of these areas can be definitely outlined and their relation to the production and purity of sugar beets determined in advance of any costly investments which might prove unprofitable.

The work of the soil survey in the Western irrigated district and the investigation of the alkali problem, which has been a serious menace in certain localities, and the results of this survey, which show that the problem can be easily and economically controlled by underdrainage and improved cultural methods, have aroused a great deal of interest, and many urgent requests have been made that the work be extended to other areas.

The tobacco investigations are bringing most important results by the introduction of new varieties and better methods of handling the crop, thereby creating new and more important types for this country and improving those already grown. It was found imperatively necessary, in order to obtain the best results, to secure the very best

available experts in this country, and in order to do this much larger salaries had to be given than had formerly been allowed in the divisional organization. The wisdom of this step has been amply demonstrated in the results attained and in the efforts of foreign countries to induce our experts to leave and transfer their valuable work to other localities.

The Agricultural Committees of both Houses of Congress looked into these matters very carefully, and, after a thorough consideration of the questions involved, decided that the reorganization of the Division into a bureau was necessary to enable the Department to handle these lines of work in a manner commensurate with their commercial importance. Accordingly this change was made by Congress, and the appropriation was very largely increased and the organization was made much more efficient than it had been on the old divisional plan. Congress also provided for the immediate use of $10,000 of the funds to allow of the plans being definitely formulated and men trained, so that on the 1st of July, 1901, the Bureau could start as a well-organized office for the efficient working out of the duties pertaining to it. This made it possible to secure the practical reorganization of the Bureau several months in advance of the actual operation of the law, and the wisdom of this has been amply demonstrated in the operations outlined in this report.

This action of Congress has opened up a new and very important era for the investigation of soils, which should be of fundamental value in the development of the agricultural interests of the country.

The following summary of the operations of the Division during the past year will show the economic aspect of the work and will be of interest to all those engaged in practical agriculture, especially those interested in intensive cultivation, and the introduction and management of new crops and industries, and in the remarkable advance recently made in agricultural industries of the country, which is the foundation of much of its commercial prosperity.

PROGRESS AND COST OF THE SOIL SURVEY.

The area surveyed and mapped during the fiscal year was 5,596 square miles, or 3,581,440 acres. The area previously reported as having been surveyed was 3,486 square miles, making a total of 9,082 square miles, or 5,812,480 acres. Field work was carried on during the year in California, Maryland, Michigan, New York, North Carolina, Ohio, Pennsylvania, Utah, Virginia, and Washington; and the preparations were all made for field work to be started in Idaho, New Jersey, Tennessee, and Texas immediately upon the agricultural bill going into effect on the 1st of July, and also for field work in Louisiana, Mississippi, Georgia, and Florida, to be started on the 1st of October, when parties working in the Northern States will be sent South.

The following table gives the area of soils surveyed and mapped in the several States in which the work has been carried on to the end of the fiscal year:

Area surveyed and mapped during fiscal year ending June 30, 1901, and the area previously reported.

State or Territory.	1901.	Previously reported.	Total.	
			Square miles.	Acres.
	Sq. miles.	*Sq. miles.*		
Arizona		400	400	256,000
California	951	450	1,401	896,640
Connecticut		245	245	156,800
Idaho	(1)			
Louisiana		1,000	1,000	640,000
Maryland	1,137	625	1,762	1,127,680
Massachusetts		155	155	99,200
Michigan	[1] 35			
New Jersey	(1)			
New Mexico		100	100	64,000
New York	[1] 20			
North Carolina	1,700	100	1,800	1,152,000
Ohio	480		480	307,200
Pennsylvania	320	100	420	268,800
Tennessee	(1)			
Texas	(1)			
Utah	457	311	768	491,520
Virginia	250		250	160,000
Washington	301		301	192,640
Total	5,596	3,486	9,082	5,812,480

[1] Field work in Michigan and New York was started on June 15, but the area surveyed in this fiscal year was too small to report upon the cost of the work and they have not been included in the total. The preparation for the other States marked were all made in the fiscal year ending June 30, 1901, but the field work was actually started from the 1st to the 3d of July.

The total cost of the work in the field amounted to $11,309, of which $1,500 was paid by various State organizations. Including the cost of the work in the field, the preparation of reports, and transportation and supplies, the field work has cost the Department on the average $3.26 per square mile, or about 51 cents per 100 acres. This is exclusive of the cost of publications. That the results have been of value to the communities and to the country at large has been attested in many gratifying ways. Requests for the extension of the work have come from prominent and thoughtful men in nearly all the States and Territories and from those interested in many of the large agricultural interests, such as sugar beet, tobacco, wheat, truck, rice, fruit; and especially from many areas where peculiar conditions of soil, climate, transportation, or labor make it necessary to introduce new crops or new methods for successful competition in the interests of the country.

Our trained soil experts remain from three to nine months in a district, visiting almost every foot of the area and mapping what they

find, studying the methods and conditions, meeting the people and learning of their successes and failures, and thus they can not help acquiring a fund of information relative to the soils, crops, and methods of the districts visited which should be a basis for the introduction of new crops or improved methods. The field men have at all times the cordial support and all the resources of the laboratories of the Bureau of Soils and of the other scientific divisions and bureaus of the Department.

Demands have been made on the Bureau for the extension of the soil survey to Alaska, Porto Rico, Hawaii, and more recently from the War Department for trained men for similar lines of work in the Philippine Islands. The lack of a sufficient number of trained men has prevented an extension of the work to any of these areas heretofore, but these demands should be met in as short a time as possible.

DETAILS OF THE FIELD WORK.

WESTERN DIVISION.

Results in California.—Field work was carried on during almost the entire fiscal year in California. The soil survey of 640 square miles around Fresno, mentioned in my last report, was completed during the first part of the year.

An area of about 300 square miles was surveyed around Santa Ana, extending from the foothills to the Pacific Ocean, the main part being formed by the vast delta plain of the Santa Ana River. In that portion of the region above the 70-foot contour there is little or no alkali, and the lands are well adapted to citrus fruits and nut trees. Below this elevation the lowlands are devoted either to alfalfa or natural pasturage and to important special industries of celery and truck growing. The fruit industry is hardly known in this portion of the area.

Nine different types of soil were recognized, each with distinctive agricultural values and best adapted to different kinds of crops. The soils of the high-lying portions of the area are, as a rule, well drained, and, owing to the small amount of water available for irrigation and the care which has to be exercised in the use of it, very little alkali has been found. The cementing of the canals and ditches to conserve the water gives an object lesson of the practical value of care and economy in the use of water on soils of this character in preventing the rise of alkali, which in the low-lying portion is a serious menace, but which can be controlled by underdrainage.

About 200 square miles were surveyed in the San Gabriel Valley. The problems encountered were purely soil problems, as there was no land injured by alkali or seepage waters, except a few small spots at the narrows where the San Gabriel River leaves the valley. The depth to standing water is great and the difficulties of obtaining water enough to keep the crops alive during the past dry years have been

the cause of much expense, but have undoubtedly saved the country from injury by alkali.

The most important problem which was encountered was the question of fertilizing the soils. California has no fertilizer-control law. Numerous brands of fertilizers are manufactured, each with a special object in view, and all are sold at high prices and with no guaranties but the manufacturers' analyses. The farmers are using large quantities of these fertilizers, in many cases unnecessarily, and in most cases without discretion, but in the hopes of supplying the requirements of the plant and of increasing the yield of fruit. There is great necessity for information on these points, and this information can only be gained through extensive plat experiments. The soil maps will show the best places to carry on this experimental work. Investigations in this line by some one competent to undertake such studies should be started at once, and the excessive application of fertilizers should be stopped, unless the necessity of such large applications is proved by experiment.

About 216 square miles were surveyed around Hanford. The most important problems encountered in this section are those of seepage water and alkali. All of the land is low, most of it being in the slough country, and when well drained and free from alkali is very productive. The drainage is into Tulare Lake and into the San Joaquin River by way of the sloughs which connect the Kings and San Joaquin rivers. During the winter and spring months the sloughs and streams fill with water and soak the subsoil, so that standing water is found at less than 6 feet from the surface of the ground. Everything possible is done to assist this filling of the soil with water, for the success of the following crop is supposed to depend upon the water which is thus stored in the soils. The natural drainage by the sloughs is often artificially blocked by dams during this period, and the irrigation canals continually carry water on the land. There is no question but that the crops are benefited by the water stored in this way at certain seasons, but at the same time some of the most valuable land is being ruined by the rise of alkali due to the high water table. Already large areas are left out of cultivation, and unless the present practices are changed further damage will ensue. Instead of damming the drainage systems, everything possible should be done to carry off the winter's excess of water, and, instead of depending upon subirrigation to furnish the needed water supply, the water should be applied from the top of the ground, which would tend to drive the alkali down.

In order thoroughly to reclaim the district and insure against further damage, a drainage district should be formed and outlet canals be dug for the free passage of the excess of water, and the sloughs which are now dammed should be opened. If winter irrigation is to be practiced, it should be from the surface, for subirrigation in such soils,

particularly if the level of the standing water comes to within 4 or 5 feet of the surface, involves serious danger of the rise of alkali. There are large areas of land already alkaline which could be reclaimed at a profit, and it is hoped that these investigations will make this point so clear that the people of the district can be prevailed upon to make the experiment of reclaiming small areas for demonstration.

Results in Utah.—About 310 square miles were surveyed around Ogden. This area is divided into two agricultural districts, a broad delta plain, upon which Ogden is situated, and in which the principal irrigation is carried on, and an upland portion composed of foothills and mountainous land. In addition to these, there is an area of nearly 100 square miles of recent delta, formed by the recession of the Great Salt Lake since the early surveys were made, in 1858. This land is now so full of alkali that no cultivated crops are grown upon it. Eight types of soil were recognized and mapped, each having more or less distinct differences and adapted to different agricultural interests.

The irrigation water of the district is exceptionally good and free from alkali. There is more than enough water to irrigate all the lands within the area, provided it were distributed at proper seasons of the year. Unfortunately, however, the larger part of it comes in the early spring, and there is frequently a shortage during the growing season. Plans are being considered for a large storage reservoir to equalize the distribution and to insure against seasons of drought and low water. Many of the canals run over deep, sandy soils, with no protection against seepage, and it is estimated that fully half of the water is lost in this way. This is not only an unnecessary waste of water, but is the cause of a large amount of injury by the subirrigation of large areas in which the ground water is so near the surface as to be harmful to crops. The whole area surveyed contains about 198,400 acres, of which 137,000 acres could be irrigated. There are actually about 40,000 acres under irrigation. In about 83,000 acres there is so little alkali that their use for cultivated crops would be absolutely safe. About 16,000 acres have sufficient alkali to make their cultivation at least dangerous, while there are 99,000 acres containing too much alkali for crops. Good lands in this vicinity are worth $100 an acre, and when set with valuable fruit trees much more than this, so that the importance of this alkali problem here is apparent.

Results in Washington.—A soil survey was made of about 198,000 acres in the Yakima Valley. Frequent mention has been made by agricultural investigators of the alkali in the soils of this valley. The amount of alkali found by our parties was very small when compared with the area which has been irrigated, but the land which is damaged is near Yakima and is the most valuable land in the valley owing to its proximity to town and the ease with which it can be irrigated. Under the Sunnyside Canal, below North Yakima, practically no land has

been damaged yet, but there is alkali in the subsoil which may rise to the surface in low places. Excessive amounts of water for irrigation are constantly being used, and the subsoil is rapidly filling with seepage water. If this rise of subsoil water goes on much longer lands will suffer. Only a small percentage of the available land is irrigated at present, and it is hoped that the dangers of overirrigation may be shown so clearly that land which is now threatened may be saved.

EASTERN DIVISION.

Results in Pennsylvania.—During the fiscal year the survey of Lancaster area, 270 square miles, started during the latter part of the previous year, was completed. Lancaster County was selected for the work, as it is an important tobacco-producing section, that it might serve as a basis for the experiments on the improvement of the Pennsylvania tobacco and the introduction of the Cuban type of filler leaf. The area surveyed consists of a broad limestone valley, with sandstone and shale ridges of sedimentary rock, and, in the southern part, of the Piedmont plateau of crystalline rocks. The difference in the commercial value of the eight types of soil established is very great. The best limestone lands are worth from $125 to $250 an acre, while some of the other soils have merely a nominal value. The investigations, while started in the interests of the tobacco culture, indicate that new industries may be established on soils that at the present time are held in slight esteem. Important lessons are taught from the industry of the people which would be of immense practical value if applied in other localities. Active steps have already been taken to follow up this survey with an attempt to introduce a better type of tobacco on certain soils which closely resemble some of the Cuban soils.

During the spring of 1901 this work was extended into Dauphin and Lebanon counties.

Results in Ohio.—A soil survey was made of Montgomery County, comprising an area of 480 square miles. This county is the center of the Zimmer Spanish cigar-filler tobacco district, and it is intended to follow up the survey with tobacco investigations similar to those planned for Pennsylvania. The eight types of soil found in the county are derived from glacial material, which has been reworked to some extent by stream action.

Results in North Carolina.—The North Carolina department of agriculture asked the cooperation of this Department two years ago in the classification and mapping of the soils of that State, as a basis for experimentation upon the crops and methods of cultivation and fertilization best adapted to the several soils. In pursuance of this cooperation, a soil survey was made from Raleigh to Newbern, a distance of 100 miles, with an average width of about 9 miles, crossing the entire section of the coastal plains and reaching up into the soils of the crys-

talline rock areas of the Piedmont plateau. The area selected was close to the Neuse River, which has considerably altered the materials within a few miles of its channel, making such changes, in fact, that 16 distinct soil types were recognized and their agricultural values determined. It seems almost incredible that in a district so comparatively small as this, and on what has always been considered rather a uniform portion of the coastal plain, there should be so great a variation in the soil types, and that these different soils should have such markedly different values for crops.

The fact remains, however, that the differences are very great, and it was pointed out in the report that certain of the types are adapted to certain interests peculiar to that region or to similar regions of the coastal plains which have been studied elsewhere. The soils adapted to truck crops, bright tobacco, cotton, wheat, corn, and grass, and those which are not adapted to any of our present crops, are indicated on the maps and are described in the report.

In the spring of 1901 an area of 800 square miles was surveyed around Statesville, N. C., and a camp was established there for the training of some of our field men. The soils in this area are derived from granites, gneisses, and other crystalline rocks, and are similar to the soils of the Piedmont region in Virginia and Maryland. The principal crops are cotton, corn, and wheat. It was apparent during the survey that the agricultural possibilities of the two principal soil types have never been realized. There is a wide opportunity for the introduction of improved methods and of new crops and agricultural interests, and the North Carolina department of agriculture has announced that these possibilities will be fully investigated.

Results in Virginia.—The demands for the soil work in Virginia were so great and from such a number of widely different localities in the State that it was difficult to determine where the survey should be started. It was finally decided to take up an area in Bedford County, including a portion of Piedmont Virginia and of the Blue Ridge Mountains, and then to enter Prince Edward County, which is typically a dark-tobacco district. About 600 square miles will be surveyed in Bedford County. On the Piedmont portion of the area the soils are derived from disintegration of crystalline rocks, and the prevailing types are well adapted to grass and corn particularly. Considerable attention is already paid to the raising of cattle, and the heavy shipping and manufacturing tobaccos are produced to some extent. The most important results of the survey, however, are looked for in the classification of the mountain lands in the development of the apple industry. This section is already recognized as a prominent apple-growing district, but there is room for the extension of both the apple and peach industries. Soil types are being recognized and mapped which are adapted to these fruits and to their different

varieties, and it is believed that the work will be of great value to horticulturists.

Results in Maryland.—The cooperation with the Maryland geological survey and Experiment Station, looking to the development of the agricultural industries of the State, has been continued. Soil surveys of St. Mary, Calvert, Kent, and Prince George counties were completed during the fiscal year. In St. Mary and Calvert counties there are eight types of soil, which differ greatly in character and agricultural value. They are suited to different crops and agricultural conditions; but this fact has never been fully realized, and it is only by realization of this and the proper adaptation of the soils to the crops that the greatest development of the country can be brought about. There are soils there ranging in value from $3 to $10 an acre which are in every way equal to the soils in other localities worth ten times as much, and which are profitably worked at this valuation. In Prince George County a greater number of soil types was encountered and a greater variety of interests can be subserved. The proximity to the Washington and Baltimore markets should make it possible to introduce intensive methods, which would greatly change the agricultural conditions of the region. It is understood that the Maryland Experiment Station will actively push the further investigation of the possibilities of developments in the crop interests and of new methods adapted to different soils.

DRAINAGE INVESTIGATIONS.

Attention has frequently been called in the reports of the Division of Soils to the possibility and feasibility of reclaiming alkali lands and preventing the deterioration of lands from alkali by efficient underdrainage. This has been dwelt upon by other writers and presented in the strongest possible terms as the most rational and only safe method of solving the alkali problem. Unfortunately, on account of the conservatism of growers, these recommendations have received little or no attention, and there is no general recognition of the possibilities of controlling the problem in this way. Owners who are not at present troubled with alkali do not appreciate the necessity of protecting themselves, and it is a curious fact that just before the alkali becomes so strong as to prevent profitable cultivation the crop yields are the largest. After that the land deteriorates so rapidly that the owner is disheartened and is not inclined to invest money where ordinary means of cultivation have failed to secure profitable returns. It was necessary to make a practical demonstration of the possibilities of growing Sumatra tobacco in Connecticut to get the industry started. The recommendations of the Department in this regard were unheeded until the correctness of its predictions were thus demonstrated.

Attention has heretofore been called to the possibility of reclaiming

the alkali soils of the Yellowstone Valley and to the desirability of reclaiming the great alkali flat in the Salt Lake Valley, covering upward of 60,000 acres of redeemable land. It will be necessary, in order to secure the greatest benefit from the soil investigations, to make an actual demonstration of the practicability and efficiency of underdrainage in the reclamation of these alkali tracts.

In 1864 the Government of India published correspondence relating to the deterioration of lands from the presence of alkali, in which the following statements were made:

In the districts reported there were 59 villages in which the agricultural industries had been wholly or in large part destroyed by the rise of alkali. By the year 1850 it had made great progress and was becoming alarming. From that time until 1858 it increased yearly with frightful rapidity. The cause was attributed to the rising of the springs throughout the tract to within a very short distance of the surface of the soil. First of all is the development of the alkali; second, condition of dried swamp; third, inundation. Water in these valleys used to be about 40 haths (60 feet) below the surface, and in 1858 it was 2 or 3 feet. No temporary improvement can arrest the natural course of things, and notwithstanding accidental checks the work of deterioration, if left to itself, will gradually complete itself, the completion depending upon the amount of land the amount of water can affect. Attention is called to proper construction of canals and irrigating ditches, so as to prevent loss from seepage, and the necessity of economy in the use of water. With such precautions taken, underdrainage would be a sure means of reclaiming the lands from alkali and seepage waters. There is no economical substance practicable within the means of cultivators of any section capable of remedying the saline matters, but wherever drainage can be accomplished the thorough working of the surface soil, with abundance of water from the canal, will, if continued for a couple of seasons, dissolve and carry away the noxious salts, but the drainage must be efficient and rapid, otherwise the salt will merely dissolve and be again deposited in the same place. Drainage will prevent as well as cure, and even a small decimal percentage will surely and in no very long time accumulate to 3 or 4 per cent or more, according to the circumstances of the ground in relation to evaporation and drainage. Wherever alkali comes from, drainage is the only and efficient cure.

With these plain warnings from the reports of English engineers to the Government of India, it would seem that the people and the Government itself had been sufficiently well informed of the gravity of the situation and of the means for the removal of these causes. Yet in reports published by the Government of India in 1870, and even as late as 1881, it is stated that underdrainage had not been attempted, that the recommendations of the engineer officers ten or twenty years before had not been carried out, and that the alkali question was becoming more and more serious and alarming, while the Government was being called upon to support large numbers of people who had been rendered destitute by the encroachments of this evil.

In view of such marked examples as this of the ultraconservatism of agricultural communities, and the fact that the recommendations made by this Department are little heeded, I am becoming more and more convinced that, in order to carry the lessons of the soil survey home to

the individual, it will be necessary for the Department to undertake a practical demonstration of the efficiency of drainage in the reclamation of alkali lands.

Plans were made for such a demonstration during the latter part of the fiscal year, with the cooperation of the Utah Experiment Station and some of the public-spirited people of that State. It was proposed to underdrain a small tract of 10 or 20 acres and cultivate the land in a proper way for two or three years to note the improvements in condition until agricultural crops could be safely grown. The expense of underdrainage when undertaken on a considerable scale should not exceed $15 or $20 per acre, so that the cost of a demonstration of this kind would not be great. Unfortunately the plans were interfered with and the work has had to be temporarily abandoned. It should, however, be taken up at the earliest practicable time.

A great interest has been taken in this line of investigation in Montana, Utah, Arizona, and California, the places where the soil survey has been carried on. A great deal of interest has been expressed in this enterprise, particularly in the Yellowstone Valley, at Salt Lake City, and at Fresno, and plans are now under consideration for a demonstration of this kind at these places.

The actual field expenses of such an experiment would hardly amount to more than the cost of publication of a bulletin containing recommendations which would receive but little notice. The demonstration itself, however, if definitely carried out, would be of infinitely more value, as it would be an object lesson for the people and could not fail to arouse an interest which would spread throughout the community. While the Department is spending thousands of dollars for the investigation of these problems, the matter of expense of such demonstrations should not be considered, provided, as in this case, it seems necessary to use this means to inaugurate better methods, which will be of immense benefit to the localities.

SOIL CLIMATOLOGY.

The Division of Soils was originally organized in the Weather Bureau, under a clause "to investigate the relation of soils to climate and organic life." When for administrative purposes it was reorganized as an independent division of the Department, this work was still recognized as of paramount importance and is still authorized under the first clause of the annual appropriation bill. It was pointed out that the soil, being the receptacle of the rainfall and maintaining the only immediate water supply for crops, is a factor of climatology, and as different types of soil maintain different quantities of water, it may be assumed for all practical purposes that crops growing on these different types of soil, even with the same rainfall and temperature, are really under different climatic conditions. This is the basis of much

of the specialization of agriculture and a principal cause of the local importance of certain districts for special crops, such as truck, tobacco, and fruit, as well as for the distribution of such farm crops as corn, wheat, and grass. The recognition of this fact is largely the basis of the soil survey and for the highest prosperity of agricultural communities. Furthermore, it is a well-known fact that the degree and character of cultivation has a marked effect upon the moisture supply of the soil, and thus controls in no little degree the climatic conditions under which the crop is grown.

In certain sections of the country and on certain soils, notably in California and the Northwestern States, the condition of the soil for various crops and the probable yield can be fairly estimated from the water supply in the soil some weeks, or even months, before the harvest.

In former reports attention was called to the progress made in the perfection of instruments for recording the moisture contents of soils in the field and for determining the tendency to evaporation or loss of water from plants for which an adequate moisture supply must be maintained. Stations were established in different parts of the country and on important soil types for these moisture records. From these records it was possible to show the normal variations which could occur in any soil between the conditions of excessive wet and drought, and the possibilities were pointed out of determining a numerical relation between the soil moisture and the sunshine, temperature, humidity, and wind velocity which would enable the climatic condition to be expressed by some figure representing the relative condition of plant growth at any place in terms of the most favorable conditions. This is in no way covered by the work of the Weather Bureau, which is concerned largely with dynamic meteorology, or the laws and prediction of storms, and will involve an entirely different equipment and an independent set of observations, taken in the fields and soils of growing crops rather than in cities and towns.

The value of such observations, taken by a corps of experts trained to observe and understand plants as florists understand greenhouse plants, can not be estimated. Reports based upon such observations in a period of drought, such as the Middle West has just experienced, would show the actual conditions existing far more accurately than is now possible. Furthermore, as the drought limit is approached in any soil suggestions can be made for preventive measures in cultivation or cropping which may save many bushels of grain on any farm, which in the aggregate for all the farmers who would heed the warnings sent out from Washington would save an immense sum of money to the agriculturists.

The time has come when this work should be again taken up on a

scale commensurate with the extension of at least two or three crop interests. It is certain that the immediate benefit to the farmers will amply repay the expenditure.

SOIL TECHNOLOGY.

The field parties see many opportunities of improvement in the crops or methods of cultivation in the districts in which they are located which they have not time, in the rapid progress of their work, to demonstrate, and for which they must rely upon recommendations in their rather brief reports. Such recommendations seldom accomplish the object sought, on account of the well-known conservatism of growers. It may be that the evidence indicates the need of drainage or the correcting of acidity in the soil, or may suggest the introduction of new and profitable crops. Such suggestions are rarely acted upon in that thorough manner necessary for a practical demonstration, and it therefore seems advisable, if the full value of the soil survey is to be realized, to organize a division of soil technology to work out the suggestions and demonstrate the efficiency of new methods or the feasibility of introducing new crops, as has been done so successfully in the case of the tobacco work.

It is difficult to find trained men for this work in this country, and the success of such an organization would depend largely upon the personnel of the force. Our agricultural colleges should turn out such men, but they seem not to have done so. There are practical men who could carry on such work under the direction of our scientists, but they are usually so successful as managers of estates that they can not be induced to accept a place for the salaries allowed by Congress in this Department. It is necessary, in this as in other lines, to train the men ourselves, unless higher salaries are paid.

TOBACCO INVESTIGATIONS.

In my last report attention was called to the success of the exhibit of American-grown leaf tobacco at the Paris Exposition and the number of awards given. After the installation of the exhibit and the work of the jury of awards had been completed the tobacco expert of the Division spent some time, under orders from the Secretary, visiting the foreign markets, particularly in Paris, Bremen, Amsterdam, and London, where large quantities of our domestic tobaccos are sold or where we ourselves purchase leaf for our own use. The information gathered in this way of the character of the tobacco from all over the world with which we have to compete in our foreign trade, of the requirements of these markets, and of the methods of selling under the regie system prevailing in certain of the European countries,

promises to be of great value in the investigations which it is planned soon to take up of the export types from Virginia, North Carolina, Kentucky, and Tennessee.

Upon the return to this country of our tobacco expert, Mr. Floyd, active steps were taken to start some investigations on the improvement of the Pennsylvania leaf, with the object of seeing what could be done with it, and the further object of introducing a more desirable filler leaf, if such a step seemed necessary for the building up of the trade in Pennsylvania tobacco. A soil survey had been made of the principal tobacco districts of Lancaster County as a basis for the possible introduction of new varieties. In the preliminary work of manipulating the present type of leaf grown in Lancaster County a different method of fermentation was tried, in which the tobacco is fermented in bulk, according to the practice in Cuba and Florida, which had been successfully used on the Connecticut leaf the year before.

Fermentation by this process is completed within forty or fifty days, under the constant supervision of an attendant, who turns the bulk from time to time, thus making it possible to watch the progress of the fermentation and to modify the conditions if circumstances seem to require it. This is a decided gain in point of time, and is much less expensive in the way of storage and insurance risks than the old method of case fermentation, where the tobacco was set aside for from six to nine months in a tightly packed case, in which it was doubtful whether it would escape injury by black rot.

The first experiment was made on an old crop which had not fermented by the usual case method, but which had developed a considerable amount of black rot. Bulk fermentation proved perfectly successful, the quality of the leaf being greatly improved and no further development of the black rot appearing while the tobacco was in bulk or afterwards. The results of this experiment seemed to be of such marked value that several of the leading packers of Lancaster opened their warehouses to us and installed, at considerable expense, proper facilities for handling the crop. As a result of this, during the winter and spring of 1901 over 4,000,000 pounds of tobacco were fermented in bulk under our direction, with a total loss of only 35 pounds from black rot and all other damage. This is exclusive of one of the first bulks, which was almost entirely destroyed by black rot, as the conditions for handling the crop were not thoroughly understood. It is a difficult matter to give any close estimate of the usual damage from black rot, as the dealers hesitate very often before admitting that there is any at all; but a conservative estimate would show a loss of $500,000 or more per year in the Pennsylvania crop, and in some years it must considerably exceed this figure. The success of this method of fermenting the tobacco, both in improving the quality of the leaf, which is generally conceded, and in controlling the dreaded

black rot, about which there is no longer any doubt, is assured, and it is confidently predicted by the packers themselves that the new method will entirely supersede the old, especially where large crops are to be handled. If this is done it will mean a saving to the State of Pennsylvania alone of an amount far exceeding the present cost of the whole Soils Division.

In the early spring arrangements were made with four prominent growers on different soil types in Lancaster County to introduce some of the finer Cuban seed, and these experiments are now progressing under our control, the latest reports of the work being very promising. It will, of course, be several months before the actual results can be determined, but if they seem to warrant it all necessary attention will be given to the important experiments at this point in the endeavor to raise the quality of the Pennsylvania leaf.

In my last report I announced the complete success of the small experiment of growing a fine type of Sumatra leaf on certain soils in the Connecticut Valley. This experiment had been made on a small tract of one-third of an acre, and it was thought best to extend it to a larger area in order to see if, under the conditions prevailing and with the large cost of production, the tobacco could be profitably raised in the valley. Accordingly, in the spring of 1901 arrangements were made with a number of farmers in Connecticut and Massachusetts, in areas as widely separated as possible, and on typical soils which it was thought could be used for the Sumatra tobacco, and nearly 43 acres were placed under our immediate control. It was agreed that the farmers should furnish all needful material and labor, and that the Department should assume direction of affairs in the practical management of the crop.

The understanding is that all the necessary information regarding the actual cost of the work shall be at the disposal of the Department to publish, and that the Department itself shall have the right to sell the crop for the farmers, so as to insure an absolutely impartial judgment from the leaf dealers as to the quality and value of the product. It will, of course, be some time before the actual results of this large experiment will be available for publication. It has been estimated roughly that about $20,000 has been invested on the part of the farmers, with no expense whatever to the Department except that of supervision.

The experiment has attracted a most remarkable interest, and prominent growers and packers have visited Tariffville, the Department's headquarters for this work, from many places in Connecticut and Massachusetts, as well as from Pennsylvania, New York, Ohio, Wisconsin, and Florida. The present indications are that the crop will yield at least double the cost of production, although nearly three-fourths of the original cost is in what might be termed permanent improvements—that is, in the erection of the shade—which will last from

five to ten years. It is probable that within two or three months from the time of the publication of this report the data will be available for the issuing of a special report on this experiment, giving the methods and cost of production and the value of the crop. It would therefore be unwise at this time to attempt to forecast the results.

In view of the phenomenal success of the introduction of Sumatra leaf into the Connecticut Valley and the control of black rot in the Pennsylvania crop, there have been many urgent demands for help in the tobacco industry in New York, Ohio, Wisconsin, Texas, and Florida. Preliminary steps have been taken to meet these demands, but they are so great that it will take considerable time to extend help even where it is most needed. Active measures are being taken, as announced in my last report, for investigating the possibilities of growing Havana tobacco in Texas, and it is aimed to make this experiment one of the strong features of our work for the coming year.

It must not be overlooked that there is pressing need of investigations in the manufacturing and export types of the Southern States, and there have been many requests for such help on the part of the Department. It has seemed wise, however, to confine our attention to the highly organized industry in the production and handling of the cigar types and to get this work well established before the other types are taken up. Just as soon as possible, however, the Virginia, North Carolina, Tennessee, and Kentucky districts will be attended to. Preliminary work is being done in several of the States in the construction of soil maps of the important tobacco areas, and plans are being perfected for the improvement of the types and grades of leaf grown there.

During the spring of 1901 a comprehensive exhibit of leaf tobacco was installed at the Pan-American Exposition in Buffalo, modeled somewhat after the exhibit at Paris, although necessarily much smaller, as the space at our command was considerably less.

Another important line which has been taken up is the securing of tobacco seed for Congressional distribution. Contracts have been made with leading growers in the various States to have seeds saved from healthy, vigorous, well-bred plants, and arrangements have been perfected for the distribution of these varieties to the districts to which they are particularly adapted. It is believed that this will be a great improvement over the former miscellaneous distribution of tobaccos of all kinds to all districts.

EXPENSES OF THE WORK.

In thus briefly reviewing the work of the Division of Soils and stating the results, the commercial value of which is already apparent in several lines, and which open up great possibilities for improving methods and crops in still others, I can not refrain from showing the

very moderate expense this work has been to the Department and to the country during the past fiscal year, as follows:

		Per cent.
Administrative expenses	$10,081.68	25.3
Laboratories	5,929.45	14.9
Tobacco investigations	5,609.64	14
Eastern soil survey	8,828.88	22.2
Western soil survey	9,392.45	23.6
	39,842.10	100

It is only necessary to compare the extent of the operations of the Division, the results accomplished during the year, and the present well-organized condition of the work with the total outlay involved to show conclusively that the money appropriated has been wisely and economically expended and that the results could only have been secured by an excellent organization and by efficient and earnest cooperation on the part of all employees of the Division.

REVIEW OF SOIL WORK.

This report marks an epoch in the work of the Division of Soils, namely, the transformation of the Division into a bureau well organized and well equipped to carry on the work in a larger and broader field than has ever before been possible. In this connection certain features characterizing the work of the Division during the past year invite special attention.

Every impartial reader of this report will concede to me the right to point to the work of the Division of Soils as work which fully and thoroughly meets the supreme test of the Department's practical utility, namely, the material benefits accruing to the tillers of the soil with a very modest expenditure of public funds.

The popularity of the work of the soil survey, as shown in the numerous requests for its extension which have come from all the States and Territories, has been amply justified by the practical results already attained by our field parties. The prophecy volunteered not so long ago of the impracticability of a comprehensive and effective soil survey has been effectually disproved. To-day there is not only no difficulty in securing active cooperation with State organizations, but cooperation has been offered far in excess of our present available force. The workers in our field parties are every season acquiring new and valuable experience, which promises to make them more useful in the future. The success of their work is attracting trained men, who look to this as one of the most promising fields for research work in economic lines. The lack of trained men previously commented on has been met by thorough and conscientious training on our part of promising young men in our laboratory and field methods, so that we are practically independent in this respect and can meet any reason-

able demands which may be made for the extension of the work within the limits of the appropriation by Congress.

In our laboratories the problems of soil physics and soil chemistry are being intelligently studied and in certain lines effectually solved, but it is perhaps in our tobacco experiments that we have achieved the most striking results, measured by the immediate effects upon the cultivator and by the appreciation of the public. These experiments are based upon the soil survey, and they justify by their results the confident statement, as anyone who carefully reads this report can see, that what has already been done, to say nothing of what we hope to do in the future, has laid the foundation of added wealth to tobacco growers in this country aggregating yearly far more than the entire cost of the Division of Soils since its establishment.

With such results as have been already achieved we can certainly look forward with the utmost confidence to the results to be obtained by the Bureau of Soils with the larger appropriation and additional equipment which have been, and which may be, provided by the far-sighted liberality of Congress.

BUREAU OF CHEMISTRY.

Chemistry is a science which touches every branch of agriculture. In the organic act establishing the Department of Agriculture, among the scientific advisers which the Commissioner of Agriculture was authorized to appoint, a chemist was first mentioned. The Bureau of Chemistry is the natural outgrowth of the Division of Chemistry, which was the first scientific office established at the time of the organization of the Department in 1862. The work of this branch of the scientific service has gradually extended until it has reached its present proportions. Gradually the chemical work of the Department of Agriculture has come to be regarded as the most important of all the chemical work for the Government. The scope of the work at the present time, together with the relations which have been established by it with other Departments of the Government, can best be illustrated by a brief statement of the nature of the investigations which have been conducted during the fiscal year ended June 30, 1901. During that period there were received for examination or analysis in the Division of Chemistry 3,824 samples of all kinds.

INVESTIGATIONS OF THE COMPOSITION, NUTRITIVE VALUE, AND ADULTERATION OF FOOD PRODUCTS.

The subjects of investigation have been, first, the study of the composition, nutritive value, and adulteration of food products. The work of the year has been devoted particularly to the study of preserved meats, with a view of comparing the preserved article with the origi-

nal, in respect of its composition and nutritive value, and to determine the preservatives, if any, which are employed in the process. This is a part of the elaborate work which has been carried on for many years in this line and which is recognized throughout the world as the most important contribution to this branch of agricultural science which has ever been made. The bulletins relating to the subject of the adulteration of foods, although printed in more than the usual numbers, have been entirely taken up by the demands from scientific men throughout the world, so that none remain now for distribution. The importance of this work has been recognized in a very practical way by the publication of a volume, by high chemical authorities, on food adulteration, in which it is stated that the contents of the work consist chiefly of the investigations of the Division of Chemistry and that the justification of its publication lies in the fact that the bulletins containing these investigations are no longer available for use.

The importance of securing pure food is of equal value both to the farmer and the consumer, and the efforts of the Division of Chemistry have been for many years and still are devoted to this great purpose.

EXAMINATION OF IMPORTED FOOD PRODUCTS.

In connection with this work, by special authority of Congress, the Division of Chemistry has examined food products imported into this country which are suspected of adulteration or of containing injurious constituents. While Congress has not authorized the Department of Agriculture in any way to protect the people of this country from frauds in food adulteration, it has conferred the authority upon the Department of protecting the health of our people from injurious substances imported in foods. The investigations during the past year have been devoted particularly to olive oils, preserved meats, and wines. The greater part of these investigations is considered of a confidential nature, and the results have not been published up to this time. It is believed, however, that the time will soon come when the results of these investigations can with profit be given to the public.

EXAMINATION OF FOODS INTENDED FOR EXPORT.

With a similar purpose in view, the Congress of the United States has authorized the Secretary of Agriculture, through the Bureau of Chemistry, to inspect American food products intended for export to foreign countries where chemical and physical tests are applied to the sale of foods. Unfortunately Congress did not give a sufficient appropriation to the Bureau of Chemistry to permit the execution of this law in a proper way. It is important that our food products going abroad be pure and wholesome, and that we protect our exporters

against any unjust discrimination in foreign countries. To this end an inspection, such as Congress provided for, is absolutely necessary. During the past year this inspection was devoted particularly to exported dairy products and wines, but it is hoped that Congress will provide for the extension of this work to all food products of every description.

INVESTIGATIONS IN CONNECTION WITH ASSOCIATION OF OFFICIAL AGRICULTURAL CHEMISTS.

The Division of Chemistry has continued during the year to study methods of analysis and investigation of soils, fertilizers, fodders and other feeding stuffs, tannins, sugars, and dairy products, in connection with the Association of Official Agricultural Chemists of the United States. This work, in which the Division of Chemistry has taken a leading part during the past sixteen years, has placed the agricultural chemists of this country on a plane which, for unity of action and purpose and the value of the results obtained, has enabled them to secure a higher position of authority and achievement than any of the other agricultural chemists of the world. There is, in other words, no organized body of agricultural chemists to-day which compares in efficiency and thoroughness of work with our own, and this has been due largely to the work of the Division of Chemistry, in collaboration with the agricultural chemists of our colleges and experiment stations.

WORK OF FOREST CHEMISTRY.

The work of forest chemistry in the Bureau of Chemistry is of the utmost practical importance to the investigations of forestry. This work is devoted to the study of forest products in regard to their composition, their relation to the soil, and the products which they can yield. When it is considered that many of the great technical chemical industries of the country are intimately dependent on forest products, the magnitude of this work is easily understood. Among these great interests the tanning industry stands, perhaps, first, followed closely by the industries devoted to the manufacture of wood pulp and to the distillation of wood and the production of wood spirit, methyl alcohol, acetone, pyroligneous acid, charcoal, and other products. This work is now thoroughly organized in the Bureau and will be prosecuted with still greater vigor.

WORK OF DAIRY CHEMISTRY.

The laboratory of dairy chemistry in the Bureau has been more fully equipped and organized and is devoted especially to a study of the best methods of detecting adulterated or preserved dairy products and of preventing unjust discrimination against these products in foreign countries by the application of crude or imperfect methods of analysis or in the exercise of discrimination in any way prejudicial to our interests.

STUDY OF SUGAR-PRODUCING PLANTS.

The sugar laboratory of the Bureau of Chemistry continues to study all the chemical problems relating to the production of sugar-producing plants and the manufacture of sugar therefrom. The chief part of the work is devoted to the study of sugar beets and especially to the influence of environment upon the sugar content thereof. This study is pursued systematically, in collaboration with the agricultural experiment stations, and has already revealed in a definite way the influence of the chief factors of environment, viz, temperature, sunshine, and soil, upon the sugar content of the beet.

Great interest has also lately been awakened in Georgia and Florida looking to the extension of the culture of sugar cane in those localities, and the Bureau of Chemistry has taken up a systematic examination of the soils on which the cane is grown and an analysis of the canes produced.

STUDY OF ROAD-BUILDING MATERIALS.

The laboratory for the study of road materials, established to cooperate with the Office of Public Road Inquiries, has been fully organized and is now one of the important sections of the work of the Bureau. The physical and chemical study of the materials used in building roads will lead to not only greater economy in road construction, but far greater durability. The cementation value of the materials used for surfacing a road differs so widely that the efficiency of the road depends upon the nature of this material. The investigations of this laboratory will show to road builders the exact character of the materials which it is proposed to use for surfacing and lead them to choose those which will give the highest efficiency.

The laboratory has in no way been advertised, except in the exhibit made at the Pan-American Exposition, owing to the limited facilities for carrying on the work; but even with this necessary precaution it has been impossible to keep pace with the heavy demand for tests. Samples have been received from all parts of the United States and even from our foreign possessions.

At the present time the laboratory has the equipment and facilities for testing all varieties of macadam rock, gravels, and clays, and in a short time the equipment for testing paving brick will be ready. In the testing of paving brick, not only will the physical properties of the manufactured brick be determined, but a thorough study will be made of the methods and materials used in making the various types of brick to aid the manufacturer as much as possible in improving his products. The prime object of this laboratory is to aid road builders in selecting the best available materials for their roads.

When it is considered that the cost of properly constructed macadam roads is from $3,000 to $10,000 a mile, and that the cost of paved

roads is generally much greater, it can be seen that selecting the proper material is a very important matter.

CHEMICAL WORK FOR OTHER EXECUTIVE DEPARTMENTS.

The work which the Bureau of Chemistry does for the other Departments of the Government is already great and is constantly increasing in magnitude. By arrangement with the Secretary of the Treasury, the chief of the Bureau of Chemistry has been designated as supervisor of sugar tests in the laboratories of the appraisers at the ports of New York, Philadelphia, and Boston. The control of this branch of the chemical work of the Treasury is of the utmost significance, as sugar furnishes a larger revenue than any other one item imported into the United States. Many suits have been brought against the United States on the alleged grounds of collecting a higher duty than the law contemplates on imported sugar, and this fact led the Secretary of the Treasury to solicit the cooperation of this Department in securing the highest possible accuracy in the scientific ascertainment of the amount of duty to be levied.

For the War Department the Bureau of Chemistry has continued to examine many of the articles of food, clothing, and other supplies for the Army, and this work is continually increasing in magnitude.

For the Post-Office Department the Bureau of Chemistry continues to examine all articles which are supposed to be unmailable under the law or fraudulent in nature.

For the State and other Departments the stationery and inks which are used in producing records are examined in the Bureau of Chemistry.

For the Department of the Interior the Bureau of Chemistry has undertaken a thorough examination of the hot springs in the reservation at Hot Springs, Ark.

Many other miscellaneous items are submitted by the various Departments of the Government for investigation in the Bureau.

It is thus seen that not only is the Bureau of Chemistry charged with chemical investigations of all kinds which relate to agriculture, but also has gradually extended its investigations to the necessities of other Departments. It has thus gradually grown to be recognized as the leading chemical laboratory of the Government, to which all of the Departments have recourse in cases of need for chemical work. It is hoped that Congress will provide for this expanded work of the Bureau of Chemistry, since chemical work can be more economically and efficiently done under a common supervision rather than by the establishment of separate laboratories for every character of investigation.

BUREAU OF FORESTRY.

The work of this Bureau includes the making and execution of working plans for Federal, State, and private forest lands; the study of forests, forest fires, forest grazing, commercial trees, lumbering, and

forest products; the study of economic tree planting and the preparation of planting plans. The Bureau is cooperating with the Federal Government, with several States, and with many private owners in handling their forest lands. Its assistance has been asked for a total area of 52,170,036 acres, of which about 4,000,000 acres are held by lumber companies and other private owners. In its studies of commercial trees and forests, and of their forest problems, it is pursuing lines of investigation indispensable to the development and perpetuation of our national forest resources. Its work of tree planting on the treeless plains already involves the making of planting plans for many thousands of acres of wood lots, shelter belts, and commercial plantations.

On the 1st of July of the present year the Division of Forestry became a Bureau. The change was incidental to the partial reorganization of the Department of Agriculture by Congress at its last session, but it was brought about by the increased understanding of the need of forestry among our people, and especially by the appreciation in Congress of the practical methods used by this Department in its forest work. The change from a Division to a Bureau opens a way for larger organization and more extended work which the public and private demands for assistance in practical forestry have made imperative. The work of the Bureau of Forestry is now conducted along three principal lines: First, forest management, which involves the preparation and execution of working plans for Federal, State, and private forest lands; second, forest investigation, which includes the study of commercial trees, of economic tree planting, of forest fires, grazing, lumbering, forest products, and other important lines of research; and third, the making and maintenance of records, which covers the routine work of the Bureau and the care of its library, laboratory, and photographic collection.

I am glad to report that the Bureau, under its present organization, can meet much more effectively the demands made upon it than was possible as a division. During the fiscal year these demands have not only increased along lines already established, but the growing tendency to refer all important forest matters to the Bureau has been more marked than at any time in the past.

The demands for the assistance and advice of the Bureau are insistent and widespread, and its sphere of usefulness has extended widely with the sound and steady development of the forest movement. With the added effectiveness of its present organization, the adequate extension of its field force, now first made possible by the training of men in our forest schools, and the urgently growing need of its services, the Bureau of Forestry has before it a future rich in possibilities for useful work if its resources do not fall too far behind its actual needs. I have not hesitated to recommend a considerably increased appropriation for the Bureau of Forestry for the coming fiscal year,

because of the vast interests which depend on forest preservation and wise use. In a very real sense an appropriation for these purposes protects and promotes the interests, among others, of all that vast body of our citizens to whom the success of irrigation, mining, grazing, transportation, or the timber trade are of primary importance.

The rapid progress of interest in forestry throughout the South is most gratifying. A very considerable proportion of the most important recent work of the Bureau of Forestry lies in the Southern States.

With the view to encouraging the substitution of conservative for destructive methods, the Bureau has undertaken the preparation of working plans, giving full directions for the management of forest tracts, and will also afford practical assistance on the ground, without cost to the owners of wood lots. In the case of large tracts, however, the cost of traveling expenses and subsistence, together with the necessary helpers of the agents of the Bureau while in the field, must be borne by the owner.

FOREST MANAGEMENT.

The requests upon the Bureau of Forestry from private owners for practical assistance and advice in the handling of their forest lands continue steadily to increase. Of the recent requests for assistance the most noteworthy is the joint application of the Kirby Lumber Company and the Houston Oil Company for help in devising the best method of managing 1,000,000 acres of long-leaf pine land in Texas. This area includes considerably more than half of the long-leaf pine lands in that State.

Personal examinations in the woods were made during the year of 788,890 acres of private ownership, and four detailed working plans were prepared, covering an area of 226,000 acres. One of these was for the tract of a lumber company in Arkansas and another for a tract in Missouri owned by the Deering Harvester Company. The preparation of working plans was begun upon five timber tracts of private ownership, with a total area of 628,000 acres. The largest of these consists of 300,000 acres in Maine, owned by the Great Northern Paper Company. The fact that the offer of cooperation under which these working plans are made is being taken advantage of so extensively by lumber companies and other business organizations indicates clearly the real practical value of the Bureau of Forestry to private owners.

The preparation of working plans for the Federal forest reserves goes steadily on. The working plan for the Black Hills Forest Reserve has been completed, and working plans have been begun for the Prescott, the Bighorn, and the Priest River forest reserves. The immense labor involved in some of these plans is indicated by the fact that for the Black Hills plan alone the diameter of every tree, large or small, was measured on 10,234 acres, and complete ring countings were made

for 4,500 trees. All these field measurements require painstaking elaboration in the office.

In cooperation with the State of New York, which appropriated $3,500 for that purpose, the field work necessary to a working plan for townships 5, 6, and 41, Hamilton County, in the Adirondack Forest Preserve, has been completed. The results of similar cooperation on township 40 have already been printed in the form of a complete working plan.

FOREST INVESTIGATION.

Studies of commercial trees, the practical advantages of which are becoming more and more evident, were continued during the year and extended to many species hitherto not investigated. Extensive studies of the redwood, red fir, and hemlock of the Pacific coast have been completed and are ready for publication. Other trees under investigation are the Western yellow pine, the loblolly and short-leaf pines, the more important Southern hard woods, the Adirondack balsam, and the second-growth hard woods of New England. The location, size, and ownership of the Big Tree groves in the California sierras have been thoroughly studied for the first time, and much fresh information has been obtained of the character of the tree.

The region containing the proposed Appalachian Forest Reserve was examined in cooperation with the United States Geological Survey. The forest on 9,600,000 acres was mapped, the lands were classified, and a careful study was made of the forests. The result of this examination will be embodied in a report dealing with the suitability of this region for the purpose of a national forest reserve, the cost of such a reserve to the Government, and the good which would result from its careful and conservative management.

The creation of the proposed reserve is, in my judgment, urgent, in order to protect the headwaters of important streams, to maintain an already greatly impaired supply of timber, and to provide a national recreation ground which, with the single exception of the Adirondacks, will be readily accessible to a larger number of people than any other forest region in the United States. I believe that these considerations render the purchase by the Federal Government of the proposed reserve in the Southern Appalachians desirable in every way. The policy involved is not new. The proposed purchase will not involve the creation of a precedent, for that has already been done. In 1896 the Government purchased from the Blackfeet Indians of Montana an area of approximately 615,500 acres for the sum of $1,500,000, and on February 22, 1897, it became a part of the Flathead Forest Reserve.

A study of the Sierra Forest Reserve has been undertaken, also in cooperation with the United States Geological Survey, and will shortly be completed.

Following the request of the Secretary of the Interior for reports on technical forest matters, the effect of grazing and of forest fires was investigated in twelve of the forest reserves. A study of the present forest condition of Nebraska and of the causes which led up to it was begun and pushed far toward completion.

The Bureau is now conducting an investigation in the South to devise conservative and practicable methods for improved turpentine orcharding. Since the maintenance of the naval-stores industry is of urgent necessity in the Southern States, this investigation is one of the most important now being carried on by the Bureau.

FOREST EXHIBITS.

The forest exhibit of this Department at the Pan-American Exposition was superior in size and quality to that at the Paris exhibition, which was awarded a gold medal. It included the largest colored transparencies ever made.

TREE PLANTING.

One of the most important and promising lines of work of the Bureau of Forestry is its study of economic tree planting and its cooperation with farmers and others in making forest plantations. Tree planting has so vital and intimate a relation to the welfare of the farmer in the treeless regions that whatever assists him to grow trees assists him also in the production of every other crop. Forty-six thousand one hundred and forty-five acres were examined for planting during the year, and planting plans were prepared for 5,785 acres, while 148 applications for tree-planting plans have been received. The number of applications for commercial plantations of large size is increasing so rapidly that the usefulness of the practical assistance and advice offered to the tree planters will be limited only by the men and money available for the work.

A series of important measurements of the growth of planted groves in the treeless plains has been begun in order to show the value of plantations as business investments. A careful study has been pushed during the year of the encroachment of forests on the Western plains in order to determine the possibility of reclaiming portions of non-agricultural Government land by planting forests.

OFFICE OF EXPERIMENT STATIONS.

PROGRESS OF THE STATIONS.

During the past year the Office of Experiment Stations has made a broad inquiry to determine how far the operations of the agricultural experiment stations are conducted with special reference to the agricultural needs of their respective States and Territories. This inquiry

has shown conclusively that by far the largest part of the work of our stations has direct relation to the important agricultural interests of the communities in which they are located. It has also shown that the nature of the operations of the stations is becoming better understood by our farmers, and that the desirability of more thorough and far-reaching investigations is much more appreciated than formerly. A broader and deeper foundation of scientific inquiry is being laid each year, and there is a constant accumulation of data regarding the general agricultural conditions of the different regions of the United States. The climate, soil, water supply, native and cultivated plants, injurious insects, fungi, and bacteria are being studied in more detail and with greater thoroughness than ever before. Best of all, this scientific work is having a beneficial effect on more practical operations of our stations. These are assuming a more substantial and systematic character, and are being conducted with more definite relation to actual conditions. They have, therefore, a greater assurance of successful practical outcome.

Questions relating to the introduction of plants or to the improvement of the live-stock industry in any region, for example, are now being investigated with a strict relation to the real requirements of the agriculture of that region, which would have been impossible a few years ago. Public attention has recently been strongly and favorably attracted to the successful results of the work of our stations, in cooperation with this Department, in making it possible for our farmers to have an abundant supply of forage for their live stock under varied regional and climatic conditions. The relatively large use which is now made of such crops as alfalfa, kafir corn, cowpeas, and rape is generally acknowledged to be due to the persistent and well-directed efforts of the stations and this Department. This is a matter of very great importance to our agriculture when we consider the vast interests involved in the animal husbandry of the United States.

In some ways the past year has been notable in the progress of agricultural research in this country. The results of practical importance already attained have inspired the public with such confidence in the value of this kind of investigation that Congress and State legislatures have been unusually liberal to this Department and the experiment stations. At the same time business enterprises requiring scientific and expert knowledge and skill for their successful management have been unusually prosperous. The managers of these enterprises have awakened to a much clearer appreciation of the value of the services of such men as are most successful workers in our institutions for agricultural education and research. An increasing number of our best workers in these institutions have therefore been given very attractive offers from the business world. So many public and private positions for well-trained and experienced workers in agricultural science and

research have been opened that in some lines the demand has outrun the supply. This has led to numerous changes in the personnel of our experiment stations, partly through the transfer of their officers to outside enterprises and partly through the change of officers from one station to another on account of differences in salary and other attractions. This is a remarkable state of things considering the length of time during which our stations have been in operation, and brings them face to face in a measure with the same difficulties which attended their earlier operations, when, for different reasons, there was an inadequate supply of trained workers.

As the work of the experiment station makes a more definite impression upon the public mind, and is more clearly differentiated from that of the agricultural college as a whole, the State legislatures are called upon to make special appropriations for investigations by the stations. A notable example of this was the action of the recent legislature in Illinois, which appropriated $46,000 for the next two years, to be expended as follows: Experiments with corn, $10,000; soil investigations, $10,000; investigations in horticulture, $10,000; experiments in stock feeding, $8,000; dairy experiments, $5,000, and sugar-beet experiments, $3,000. A number of States recognized the special agricultural needs of different localities by appropriations for substations or independent stations devoted to these interests.

In further recognition of the experiment station as a distinct unit within the college, separate buildings or parts of buildings are now more generally provided for the exclusive use of the station. The movement for the separation of the office of director of the station from that of president of the college has also been advanced by changes in this direction in six States, leaving at present only eleven States and Territories in which the college president actually performs the functions of director of the experiment station. In a number of instances newly appointed officers of experiment stations have no duties as teachers in the college, and in other instances changes have been made by which the amount of teaching required of station officers has been materially reduced. Experience has each year shown more conclusively that if station officers are to accomplish the best results in agricultural investigations their research work must be made their primary business before which routine duties of every kind must give way as the conditions of the original work demand. Our most successful stations are now managed on the principle that they constitute research departments of the colleges; that they are thus at the summit of our system of agricultural education, and that they must be managed on the same principles as those upon which the scientific laboratories in this Department and our leading universities are conducted—that is, their officers must be the best trained experts in their respective lines, and they must be able to devote their time and energy quite fully to their investigations.

COOPERATION OF THE STATIONS WITH THE DEPARTMENT.

The number and variety of cooperative enterprises between the different Bureaus and Divisions of this Department and the experiment stations have greatly increased during the past year. Progress has also been made in determining the principles on which successful cooperation must be based and the best methods of arranging and conducting such cooperation. Without doubt the Department and the stations are now in closer touch than ever before, and through their cooperation important investigations for the benefit of agriculture in many parts of the country have been greatly strengthened. Now that the preliminary questions relating to the organization of these cooperative enterprises have been largely settled and the funds which can be devoted to this kind of work have been increased, there will be a further extension of cooperative effort in the immediate future. By this combination of forces the varied national and local needs of our agriculture will be more fully met, and the benefits of agricultural research will be extended to every part of our territory. Thus we shall have a system of agricultural investigation more thorough in its organization and more wide reaching in its scope than exists anywhere else, and this vast system for the direct application of the results of scientific inquiry to agricultural practice has been so constituted that every farmer throughout the length and breadth of our land may easily and freely avail himself of whatever information is gained through the researches of this Department and the stations.

AGRICULTURAL EXPERIMENT STATIONS IN ALASKA.

Agricultural investigations in Alaska have been continued, with headquarters at Sitka and subsidiary stations at Kenai, on Cook Inlet, and Rampart, in the Yukon Valley. The chief new feature of these investigations during the past year has been the more thorough study of the agricultural possibilities of the interior, especially the Yukon Valley. For this purpose Professor Georgeson, the agent in charge of the Alaska experiment stations, made journeys into the interior during the summers of 1900 and 1901. As the result of the first of these journeys a tract of land on the north side of the Yukon River, directly opposite the town of Rampart, was selected for experimental purposes, and field experiments with rye, barley, oats, wheat, and vegetables were inaugurated. Rye seeded in the fall of 1900 wintered perfectly and was ripe early in August, 1901. Barley sown in the spring of 1901 ripened at the close of that season. Vegetables were largely destroyed by rabbits, and even those which escaped did not grow well in a new soil, confirming previous experience that it requires two or three years in Alaska to get new soil in proper tilth for vegetables. Vegetables are, however, successfully grown at the Holy Cross Mission and other points in the Yukon Valley. Professor

Georgeson reports that while he was at the Holy Cross Mission during the second week in August, 1901, "the mission was supplied from its own garden with new potatoes, cauliflower, cabbage, and other vegetables." At Sitka the experiments with cereals, forage crops, and vegetables were continued, and a considerable number of varieties were successfully grown. A log silo was also built there and filled with native grasses during the latter part of September, 1900, of which Professor Georgeson says: "The experiment was an entire success. Our work oxen were fed exclusively on silage from November 10 to May 1, and only when they were worked were they fed grain in addition. They ate the silage with relish throughout and were maintained in good condition. There was no greater loss of silage by waste than always occurs in preserving green forage."

At Kenai experiments with cereals and vegetables have been continued, with considerable success. Fall-seeded wheat survived the winter of 1900–1901 in fair condition, and spring-seeded oats, barley, buckwheat, flax, and wheat looked very promising early in September, 1901. A small plat of red clover sowed in the spring of 1900 wintered over well and made a good growth during the summer. The greater portion of the grain sown last spring at this station was from grain previously grown there, showing that grain can be matured and propagated in that region. Besides the experimental work at Sitka, Kenai, and Rampart, seeds have been distributed to over 400 persons living in different parts of Alaska, and a considerable number of reports have been received from seeds grown there during the season of 1900. There is a considerable increase in the demand for seeds, now that it is known that they are being distributed through the station. Not only are vegetables, cereals, and forage plants asked for, but there is a considerable demand for flower seeds. There seems to be a great desire on the part of a certain class of settlers in Alaska to cultivate flowers, which are more than ordinarily prized in a region where the general conditions of life are so comparatively hard.

WORK OF THE STATIONS AT SITKA AND KENAI, ALASKA.

During the summer of 1901 the assistant director, Dr. E. W. Allen, of the Office of Experiment Stations, made a tour of inspection to the stations at Sitka and Kenai, and also made inquiries regarding the agricultural possibilities of the coast region of Alaska. The following extracts are taken from his report:

The impression which I gained from this Alaskan trip was that not only is quite a wide range of gardening and some measure of agriculture possible, as has been shown by the Congressional reports of our experiments there, but that a gratifying amount of educational and demonstration work has been done among the people, which is already productive of good results. A number of private residences about Sitka show what can be accomplished by well-directed industry in beautifying them and in maintaining creditable home gardens. Many of the natives plant gardens of

vegetables and flowers, and a considerable number give them fairly good care. Near the town men were engaged in making hay on a small tract, and, with the weather prevailing at the time of my visit, it was quite practicable to dry the hay in the field. Numerous gardens containing lettuce, radishes, cabbage, peas, potatoes, and the more hardy vegetables generally were to be seen at the various places where I landed along the way. These gardens were for the most part well cared for and usually an object of pride. The quality of the vegetables raised was said to be excellent, and failures were few with persons who understood the best methods. At Kenai the gardens of the natives presented an especially well-cared-for and thrifty appearance. In many places the natives have come to appreciate the value of vegetable food in improving their diet, and the variety which a garden of fresh vegetables lends to the food of the newer residents of Alaska is much appreciated by them. Flower beds of sweet peas, peonies, and a number of other kinds of plants were not uncommon.

The seed for planting these gardens and the directions and encouragement for maintaining them have come very largely from the special agent in charge of the Alaska station and his superintendents. Everywhere I went along the coast region I found that the work of the Alaska stations was well known and usually very favorably regarded at present, although many admitted that they at first viewed the undertaking with much skepticism. Hardly a man was addressed who did not know about Professor Georgeson and his work. This is the more remarkable, and stronger evidence of the interest which has been aroused, when it is considered that there are practically no newspapers in Alaska having more than a local circulation, that no publications except Congressional reports have been issued, and that, owing to the difficulties of transportation, people do not get about as much as they do in the States. The extent to which information has been diffused and the confidence of the people won speak much for the vigor and industry with which the work has been prosecuted. The propaganda has met with a good measure of success, and the work now has many strong friends, particularly in the western coast region, where the conditions are the most suitable for agriculture.

I was impressed with the many difficulties which our agent has had to meet in carrying on his work under such pioneer conditions at a number of points widely separated. Transportation is entirely by water and is slow, mails are infrequent, the need for materials of various kinds must be anticipated several months, labor of the right kind for our work is very difficult to procure, the results must be accomplished in a short summer season, and a thousand and one little annoyances arise to hinder and discourage the undertaking. It is only through untiring energy and enthusiasm for the work and the exercise of the strictest economy that Professor Georgeson has been able to make the good showing that he has for the time and money he has had at his disposal. I do not hesitate to say that, despite these difficulties and the higher prices to be met, few if any of our experiment stations in the early years of their existence have been able to make a better showing for the money expended, in the way of buildings, permanent improvements to the land, and amount of experimental work performed, than the Alaskan stations do to-day, and the interest and confidence which have been aroused by the stations are worthy of any station in the newer States.

Now that such favorable results have been obtained with vegetable growing and some of the cereals, I am of opinion that work might be undertaken with animals to show the extent to which feed for them can be profitably or economically grown in Alaska. Fresh meat is scarce and dear. It is only occasionally that meat can be obtained to the west of Sitka. With small animals, like poultry, useful work might be done in showing what feeds can be grown for them and how they can best be cared for. Poultry raising would be the simplest beginning in animal production and might lay the foundation for work with larger animals. The hog is not commonly found, but summer pasturage for hogs could surely be raised, and it seems very prob-

able that winter feed could be grown also. The profitability of hog raising in a small way and the quality of the pork which could be produced without corn would be a good subject for investigation. Cattle raising and milk production have been tried as a business venture on a small scale at a few places. In most instances, however, the feed for the animals has been very largely shipped in, and it remains to be demonstrated to the satisfaction of the people at large at least that the necessary grain and feed can be profitably raised, so that products of good quality can be made without relying upon feeds imported from Puget Sound.

From the experience already had I am inclined to regard the raising of cattle for beef and for milk production in Alaska as entirely feasible. There are good pastures in places and natural meadows where hay of good quality can be made. From a commercial point of view the present freight rate on live cattle from Seattle to the Cook Inlet region would give the local cattle raiser the advantage of a protective tariff. Kenai and Kadiak seem well adapted to experiments of this nature and are representative of quite large areas of country. I would recommend that the building up of a herd of cattle with reference to conducting experiments in the feasibility and profitability of beef and milk production, using home-grown products to the largest possible extent, be taken up as soon as circumstances and the funds at the disposal of this work will permit.

From all the evidence received at this Department it seems clear that the agricultural investigations already conducted in Alaska have been productive of good results, and that by persistent effort sufficient agriculture may be established in this Territory to be an important aid in the development of mining, lumbering, and fisheries. To put the work of the stations on a more effective basis, funds should be provided for the completion of the headquarters building at Sitka, the erection of buildings at Kenai and Rampart, and the further equipment of the stations there, for the employment of an expert horticulturist, whose services are greatly needed, and for the purchase of live stock. The annual appropriation for the regular expenses of the Alaskan work should be at least as much as that for the experiment stations in the other Territories, namely, $15,000. For the ensuing fiscal year I recommend that an additional appropriation of $5,000 be made for buildings and the purchase and transportation of live stock.

AGRICULTURAL EXPERIMENT STATION IN HAWAII.

The first appropriation ($10,000) for the establishment and maintenance of an agricultural experiment station in the Territory of Hawaii was made for the fiscal year covered by this report. With a view to determining the conditions existing in Hawaii with reference to experimental investigations as related to the needs of the agriculture of that Territory and the location of an experiment station, Dr. W. C. Stubbs, director of the Louisiana Agricultural Experiment Stations, was sent to Hawaii, as stated in my previous report, where he made a careful investigation with special reference to the organization and work of an experiment station. His report was transmitted to Congress in January, 1901, and published. Besides much valuable information regarding the agriculture of Hawaii, this report contains definite rec-

ommendations regarding the location, equipment, organization, and lines of work of the proposed experiment station in that Territory. It was recommended that the station be established under the direct control of this Department and independent of existing local institutions. As the station already maintained by the Hawaiian Sugar Planters' Association will continue its work on problems relating to the sugar industry, it was recommended that the station to be established by this Department give its attention to other agricultural interests.

It was pointed out that among the subjects to which the station should give special attention were the culture of fruit, vegetables, rice, forage crops, stock raising, dairying, coffee growing, irrigation, and forestry. As the headquarters for the station, it was recommended that the reservation which the Hawaiian Government had surveyed and mapped in 1893 for an experimental and forestry station be secured. This is a tract of 222 acres near Honolulu, known as Kewalouka, with an elevation ranging from 50 to 1,000 feet and containing cleared and forest land. On the basis of this report a second appropriation of $12,000 was made for the maintenance of an experiment station in Hawaii during the current fiscal year. Immediately on the passage of this appropriation act I took measures for the establishment of an experiment station in Hawaii on a permanent basis. As in the case of the stations in Alaska, the general supervision of the Hawaiian Experiment Station was assigned to the Director of the Office of Experiment Stations. As the active manager of a new station Mr. Jared G. Smith, chief of the Section of Seed and Plant Introduction of this Department, was selected and transferred to the Office of Experiment Stations as the special agent in charge of the Hawaii Experiment Station. He left Washington near the end of March, 1901, and proceeded without delay to Honolulu, with instructions to establish headquarters there and to begin the organization of regular experiment-station work.

As a site for the station he was to secure possession of the tract of land in Honolulu known as Kewalo-uka, and on this to begin the clearing and fencing of land and the erection of buildings. In making plans for experimental work he was instructed—

> to consider especially the needs of the people of the Hawaiian Islands as regards the production of food supplies for home consumption, and the development of animal industry, dairying, and coffee culture, and to extend aid to the people of the different localities throughout the islands for the improvement and development of local agricultural industries through the distribution of seeds, plants, and publications, the giving of advice by correspondence and otherwise, and the institution of cooperative experiments.

He was urged to enlist the cordial support and sympathy of the Hawaiian government and people in this enterprise, and he was to announce that it would be the policy of the Department "to encourage the granting of financial assistance to the station by the Hawaiian

government, as in the case of the other States and Territories where the national funds have been largely supplemented by local grants of money for buildings, equipment, and current expenses of the station."

On examination of the records of the Hawaiian government before the annexation of this Territory to the United States it was found that while there were evidences of the intention of that government to reserve the Kewalo-uka tract for experimental purposes, the reservation had never actually been completed. Soon after the annexation of the Territory, on recommendation of the Secretary of the Navy, the President issued a proclamation (November 10, 1899) reserving 20 acres, more or less, of the best agricultural land of this tract as a site for a naval hospital, and on recommendation of the Secretary of the Treasury another reservation of 7 acres has been similarly made as a site for a hospital for the Marine-Hospital Service. Through the courtesy of the Secretary of the Navy, this Department has been granted the temporary use of the naval hospital site for experimental purposes. After negotiations with the government of the Territory of Hawaii, the larger portion of the Kewalo-uka tract was definitely set aside in proclamations issued by the acting governor of the Territory for the use of the experiment station, to be conducted under the direction of the Secretary of Agriculture.

About 50 acres of land have been cleared, and half of this area has been plowed and harrowed. This includes 13½ acres of forest land on the upper portion of the reservation, where there is sufficient rainfall to make it possible to carry on experiments without irrigation. This will be devoted to horticultural plantations, and in this way will be covered with trees again. A water system has been provided by the erection of several large tanks, which are connected with the city water system and operated with the aid of a gasoline engine and pump. The following buildings are in process of erection: Residence for the special agent in charge, office and laboratory, one frame cottage and two grass huts for laborers, one stable, and one covered manure pit.

Plantings of taro, the principal food plant of the islands, have already been begun with the special object of studying a disease which plays havoc with that crop. This is an important matter, as probably 50 per cent of the working population in these islands depend on taro for their daily food, and within the last decade the price of taro has increased 500 per cent because of the losses from this disease and the attendant deterioration in quality and yield of crop. There are many other fungus diseases of fruits and vegetables prevalent on the islands in Hawaii which should be studied. Some poultry experiments have also been inaugurated, with a view especially to finding a way of raising healthy barnyard fowls in these islands, where hitherto the supply of poultry has kept below the demand because of the losses from the ravages of diseases. It is reported that live chickens sell in

Honolulu markets for $15 a dozen, and eggs at from 40 to 50 cents a dozen. Owing largely to the insufficient supply of forage, pork production is very expensive, the ruling price for hogs in the Honolulu markets being from 10 to 17 cents a pound on the hoof. To remedy this difficulty experiments with various tubers and roots and with the common Papaya as feed for swine will be undertaken at an early day, and as soon as possible investigations in dairy husbandry will be inaugurated. Plans are also being made for experiments in horticulture, including both fruits and vegetables, and coffee culture.

Among other subjects needing the attention of the station are investigations on methods of cultivation, use of fertilizers, drainage, irrigation, and forestry. Considering the variety of subjects for investigation, the annual appropriation for the maintenance of the Hawaii experiment station should be not less than $15,000. To properly equip it with buildings, apparatus, implements, live stock, etc., a special fund of $10,000 is very much needed. Now that Hawaii is organized as a Territory of the United States, I see no good reason why in the matter of an agricultural experiment station it should receive different treatment from that accorded other Territories—that is, it should regularly receive the same appropriation as is given the other Territories under the act of Congress of March 2, 1887. The further needs of the experiment station, especially as regards land, buildings, and equipment, should be provided by the people of the Territory, acting through their Territorial legislature.

PORTO RICO AGRICULTURAL EXPERIMENT STATION.

The first appropriation for agricultural investigations in Porto Rico was made for the fiscal year ended June 30, 1901. This appropriation was $5,000 and authorized the Secretary of Agriculture to determine the agricultural conditions existing in that island, with special reference to the most desirable localities for agricultural experiment stations, as well as the subjects on which the agricultural people of the island are in most immediate need of practical information, and how this need can be most economically and effectively supplied, but it did not provide for the establishment and maintenance of an experiment station.

The preliminary investigation called for by this appropriation was made through the Office of Experiment Stations by Prof. S. A. Knapp, who visited Porto Rico during the summer of 1900. His report was transmitted to Congress and published. It contains a summarized statement regarding the climate, soil, and agriculture of the island, shows in what ways the experiment station might benefit agriculture, and recommends the establishment of a station as soon as practicable. On the basis of this report Congress made a second appropriation ($12,000) for the current fiscal year, and authorized the Secretary of Agriculture to establish and maintain an agricultural experiment

station in Porto Rico. As soon as this appropriation was made measures were taken for the establishment of the station in Porto Rico. The general supervision of this station was assigned to the Director of the Office of Experiment Stations. As the active manager of the station, Mr. Frank D. Gardner, assistant in the Division of Soils, was selected and appointed special agent in charge of the Porto Rico experiment station. He proceeded to Porto Rico about the middle of May, 1901, and after spending some time in familiarizing himself with the conditions and needs of agriculture in the island he has arranged to undertake preliminary investigations on coffee culture.

SELECTION OF EXPERIMENT STATION.

As regards the permanent location of the experiment station, more difficulty was experienced in obtaining suitable land than was anticipated. As there is no Government land available, it will be necessary to purchase land for this purpose. An effort has been made to secure donations of land from the municipalities in the island. It was found, however, that either the municipalities possessed no lands that in kind and amount would be suitable for the purpose or that their financial condition would not allow them to purchase land for the station. It was therefore determined that action in this matter should be deferred until the next meeting of the insular legislature, when an effort will be made to secure local financial aid in the establishment of the station, as in the case of the other States and Territories. Meanwhile the headquarters of the station will be maintained at San Juan, and such investigations will be undertaken as can be pursued on lands leased or loaned by residents of the island desiring to engage in cooperative work with the station. Information regarding the agricultural needs of the island and methods which may be adopted for the improvement of agriculture on the basis of our present knowledge will be collated and published, and the people will be aided in this and other ways to improve the agricultural conditions. It is hoped that before the beginning of another fiscal year the question of the permanent location of the station may be settled and that then it may be possible to proceed rapidly with the erection of buildings, the equipment of the station with apparatus, implements, and live stock, and the making of horticultural and other plantations, as well as the institution of experimental inquiries which will place this station on a par with the others in the United States. For the regular maintenance of an experiment station in Porto Rico, as elsewhere, not less than $15,000 will annually be required. I therefore recommend that Congress appropriate this sum for the Porto Rico station for the ensuing fiscal year.

AGRICULTURAL INVESTIGATIONS IN THE PHILIPPINES.

It is, in my judgment, very desirable that agricultural investigations should be undertaken in the Philippine Islands under the War Depart-

ment, and in cooperation with this Department. The need of such investigation is illustrated by the fact that such an important crop as rice, the leading breadstuff of the island, is not at present produced in sufficient quantities to supply the local demands. The growing of rice is better understood by the people generally than any other crop, yet by their primitive methods of culture and crude implements they are unable to adequately supply their own necessities. Of agricultural products—mostly food stuffs—up to 1890 there were imported annually more than $4,000,000 worth, while the exports amounted to about $14,000,000, principally hemp, sugar, coffee, and tobacco. Under the Spanish Government attempts were made to establish agricultural schools, experiment stations, and model farms, but these institutions do not seem to have exerted any important influence for the improvement of agriculture, and since the American occupation have been largely discontinued.

In instituting agricultural investigations in the Philippines it is desirable, in my judgment, to follow the precedents already made in the cases of Alaska, Hawaii, and Porto Rico—that is, a preliminary investigation should be made to determine where the experiment station should be located and what subjects it should first undertake to investigate. With headquarters for agricultural investigations once established and a single experiment station well organized, it would be easy to extend the work of agricultural research so that it would take into account the special needs of different localities. In order that there may be no delay in establishing the station after the preliminary investigation is completed, I recommend that an initial appropriation of $15,000 be made for the ensuing fiscal year to enable me to institute agricultural investigations in the Philippines, and if feasible to locate and maintain an agricultural experiment station there. In order that these investigations may be begun at an early day, one-third of this amount should be made immediately available.

AMERICAN INSTITUTIONS FOR AGRICULTURAL EDUCATION.

Considerable progress has been made during the past year in broadening and strengthening the agricultural courses in our agricultural colleges. The movement for the division of the general subject of agriculture into specialties to be taught by different instructors still continues. The committee on methods of teaching agriculture of the Association of American Agricultural Colleges and Experiment Stations, of which the Director of the Office of Experiment Stations is a member, has completed its syllabus for a college course in agriculture by presenting courses in agrotechny (especially dairying), agricultural engineering, rural economics, animal husbandry, soil physics, plant pathology, and agricultural chemistry. Thus far, comparatively little attention has been given to several of these branches of agricultural

instruction in our colleges. There are, however, beginnings of a movement for the regular establishment of such courses, which there is good reason to believe will grow with the increase of the resources of these institutions and the demands of the people. There has been a considerable increase in the total number of students attending agricultural courses in the colleges, but college faculties have in many cases failed to offer sufficiently attractive four-year courses to induce students to attend, or the trustees have failed to equip faculties with teachers who have mastered their specialties. There is a growing demand for this education, and where it does not exist the college should create it as in duty bound. There is an increasing demand for short and special courses, and the colleges are meeting this to a greater extent than ever before. A much larger amount of college extension work in agriculture is now being done. In the States in which this work has been in progress for a number of years it is being successfully continued, and institutions in other States are following the example of the pioneers in this line of education. In providing for maintenance and new buildings at the agricultural colleges, the various State legislatures meeting during the past year have been more than usually liberal, so that in the aggregate there is a large increase in the resources of these institutions.

One of the most hopeful signs of progress in agricultural education is the movement for the establishment of secondary schools of agriculture and the introduction of nature study and the elements of agriculture into the rural schools.

This Department is already giving aid to the rural schools in various ways, but I believe that the time has come for the Department to take a more active part in encouraging the introduction of nature study and elementary agriculture into the curricula of rural schools for the purpose of developing the natural tendencies of the pupils to observe and take an interest in the natural phenomena surrounding them and of fostering in them a love for the country and its pursuits.

Much encouragement may be given by distributing seeds and plants for use in establishing school gardens; by furnishing schools with collections of specimens of beneficial and injurious insects, plant diseases, and other illustrative material; by supplying teachers with the publications of this Department which will be useful to them, and by such other means as would suggest themselves as the work progressed. Without doubt, the improvement of our rural schools, so that every child throughout the length and breadth of our land may have an opportunity for education which will prepare him for good citizenship and most efficient industrial service, is one of the greatest which should engage the attention of our people. With the increased interest in country life which is beginning to be manifested in different parts of the country, there is good reason to hope that our rural

schools will be much improved in the near future, and especially that they will be so organized and maintained that in them the children will be shown the attractive side of country life and will be taught the dignity and worth of rural occupations, so as to incline them toward the study of the sciences that relate to agriculture.

FARMERS' INSTITUTES.

The farmers' institute movement in this country has now become national in its extent and in the scope of its interests, and has even assumed international relations as connected with similar movements in other countries. Having their origin in farmers' societies of various kinds, some of which date back half a century or more, the institutes have been developed through the efforts of farmers' organizations, the agricultural colleges and experiment stations, boards and commissioners of agriculture, and many individual leaders in agricultural progress, until they are now annually held with more or less regularity in nearly all the States and Territories. Beginning about thirty years ago the States have one after another shown their interest in this movement through their legislatures by appropriations to aid the institutes. Growth of interest in the institutes among the farmers has been reflected by a steady increase in the number of States thus providing for their maintenance and by the larger amounts of money devoted to this purpose from year to year. According to statistics published by the Office of Experiment Stations, in 1891 about $80,000 was spent for farmers' institutes in the United States, and of this sum about $60,000 was specifically appropriated for this purpose. In 1899 the specific appropriations for institutes aggregated a little more than $140,000, more than twice the sum appropriated in 1891, and the estimated expenditure of funds derived from other sources was $30,000, a grand total of more than $170,000 spent for institutes that year. The statistics of the institutes for the past year have not yet been collated, but the incomplete returns already received show that the State legislatures of last winter were more liberal than ever before to this enterprise.

While the statistics of the institutes collated by the Office of Experiment Stations in 1899 were not entirely complete, they showed that that year over 2,000 farmers' institutes were held in the United States which were attended by over half a million farmers. The institutes were held in 43 States and Territories. In 19 of these they were in charge of officers of agricultural colleges or experiment stations. In 17 they were under State or county officials, and in 7 they were under the joint control of State officers and college or station officers. Successfully conducted institutes are found under each system of management.

Under different names meetings of farmers in many respects similar

to our farmers' institutes are held in other countries. In some European countries in particular itinerant instruction for farmers is very thoroughly organized.

While in some of our States the farmers' institutes are quite thoroughly organized, have liberal financial support, and reach the farmers quite widely, in many of the States and in the Territories the movement is yet in a comparatively weak condition and the organization and means for this work are inadequate. Moreover, even in the States where the institutes are most thoroughly organized and have had the greatest success, new problems relating to their management have arisen with the growth of the movement. For example, there is increasing difficulty in some States in securing workers thoroughly qualified for this kind of service who can attract large audiences of farmers and hold their attention throughout the meetings.

It is a common experience that after the institutes have been held for a number of years in a given locality the farmers are not so ready to listen to local speakers or those who have nothing to give them except what has come within the range of their own limited personal experience. They demand that the institute workers shall have a wide range of knowledge regarding the science and practice of agriculture, and particularly up-to-date information regarding the progress that is being made throughout the world in studying problems in agriculture both at the experiment stations and on the farm. This has led to a demand on the officers of our agricultural colleges and experiment stations for service at the farmers' institutes far beyond their ability to meet. There is, therefore, need of developing a class of institute workers who shall combine successful practical experience and scientific knowledge of agriculture with the ability to address large audiences of farmers in a way not only to hold their attention but also to impart to them definite information and instruction. Another problem of increasing importance relates to the ways and means of reaching the masses of our farmers through the institutes. On the supposition that 500,000 farmers now annually attend the institutes, it will be seen that out of 10,000,000 farm workers in the United States only 1 in 20 is directly reached by the institutes. These are, without doubt, in the main the most intelligent men in the business, and whatever good they receive from the institutes is disseminated to a considerable extent among their less aggressive and more careless associates. But the institutes should directly reach a far greater proportion of our farmers. To do this various expedients will have to be adopted to adapt the institutes to the needs of the different classes of our agricultural population.

These examples of institute problems have been given to illustrate the fact that this movement has now reached such a stage of its development that the comparatively simple methods hitherto followed

in the organization and maintenance of the institutes are not adequate for an enterprise of such magnitude as this has become. The solution of these problems will require much study, involving a comparison of methods employed in the different States and countries. In its national and international aspects there is, in my judgment, room for much useful work by this Department which may well aid in this as in other movements for the education of our farmers and the improvement of our agriculture. While the Department has already done something toward helping institute movements, I believe that it should be put in a position to organize work in this line more thoroughly, and I have therefore decided to ask Congress to make a special appropriation of $5,000 to enable the Office of Experiment Stations to enlarge its work with a view to giving definite aid and encouragement to the farmers' institutes in the different States and Territories. This may be done by collating and publishing information regarding the institute movement at home and abroad, by furnishing the institute workers with the Department publications and information through correspondence, by advising and assisting the institute managers in different parts of the country with special reference to perfecting organization and strengthening the work in weak places, and in general the Department may act, through its Office of Experiment Stations, as a sort of clearing house for the farmers' institute movement as it has done in the case of the agricultural experiment stations; that is, it would be a center for the focalization and dissemination of information and influences which may serve to develop farmers' institutes and make them a more efficient means for the education of our farmers and the improvement of our agriculture.

I am convinced that the publications of the Department and the experiment stations do not in themselves constitute all-sufficient means for the dissemination of information on agricultural subjects among our people. While the work of the Department and the stations has already been so far disseminated and applied that it has made important changes for the better in our agriculture, the spread of the influence of these institutions is comparatively slow because the means for directly reaching the farmers which they now possess are inadequate. The farmers' institutes may in a great measure supply this lack. When properly organized, they will bring to the masses of our farmers the information which they need to enable them to understand and apply the results of the work of the Department and the stations, and will impress upon them by practical illustrations and demonstrations the benefits which advanced scientific knowledge may confer upon our agriculture. Through the institutes, as in the case of other educational agencies, the living teacher coming in contact with the living worker can produce results which it is hopeless to expect from printed documents however well written and illustrated.

INVESTIGATIONS ON THE NUTRITION OF MAN.

The investigations on the food and nutrition of man during the past year have included dietary studies and cooking, digestion, and metabolism experiments. They have been conducted in various parts of the United States in cooperation with the experiment stations, agricultural colleges, and universities. Seven technical bulletins, two farmers' bulletins, and a Yearbook article on these investigations have been published during the past year.

The evidences of popular and scientific interest in investigations on the food and diet of man continue to multiply. The results of the investigations of the Department are being incorporated in other investigations and in scientific works on this subject, and the apparatus and methods devised by our investigators are being adopted both at home and abroad. Our publications are being used in unusual extent in connection with the courses of instruction in domestic science in schools of all grades in this and other countries, and are also much sought after by women's organizations interested in the promotion of home economics.

The lines and methods of investigation of the problems of the nutrition of man have now been so far worked out that it seems desirable that some features of this work should be conducted on a larger scale than hitherto, with a view to a more definite application of their results to practical affairs. For example, while a considerable number of dietary studies have been made, these have by no means covered the variety of conditions existing in different parts of this country and among people of different occupations. A more systematic and thorough attempt may well be made to collect reliable data regarding the food habits of our people. We need especially to study the food consumption of our farmers and rural and urban wage-workers in different regions, with special reference to their hygienic and economic requirements. Again, it is believed that the results of nutrition investigations already made may be practically and beneficially applied in a wide way to the feeding of man wherever a considerable number of persons are to be fed on a systematic plan. This applies especially to boarding schools, college clubs, reformatory and penal institutions, and hospitals for the insane and other dependent classes.

A beginning has already been made in this direction, but there is still room for a large amount of investigation before definite suggestions of general application can be made. The importance of this subject may be illustrated by reference to the hospitals for the insane in the State of New York, in which the special agent in charge of our investigations has already made some studies under State auspices. The annual cost of the food supply to these hospitals has been over $1,000,000. The investigations already made show that not only may the total cost be

considerably reduced and large wastes prevented, but that the dietaries of the inmates of these institutions may be much improved by attention to the facts and principles established by nutrition investigations. These preliminary investigations have also shown the need for more accurate inquiries regarding the food requirements of different classes of persons in these institutions. In the State of New York alone not far from 100,000 people of the dependent and delinquent classes are maintained in public institutions at an annual expense of $26,000,000, of which about $6,000,000 is expended for food. This will give some indication of the vast interests at stake in this matter when we take the whole country into account. Certainly here is a field of investigation upon which the Department might well enter, and in which results of great practical value might be expected.

For the extension of nutrition investigations in the two lines above mentioned, namely, (1) dietary studies of farmers and rural and urban wage workers, and (2) studies with reference to the utilization of the results of nutrition investigations in public institutions, I indorse the recommendation of the Director of the Office of Experiment Stations that $5,000 be added to the present appropriation for the nutrition investigations.

Now that the governmental, commercial, and other interests of our people are so largely concerned with tropical regions, the determination of the food habits and requirements of people living in such regions has become a matter of much importance. The continuance of soldiers, sailors, and civil officers of the United States in such regions would of itself justify the institution of investigations to determine the best dietaries for their use while there. With our rapidly expanding commerce and the going out of considerable numbers of our people to reside in tropical regions, there is additional reason for undertaking such studies. Moreover, we need to study the dietaries of the native populations which have recently come under the control of the United States, with a view to determining the relation of their food habits to their health and industrial efficiency. Such investigations may easily become an important factor in the agriculture, trade, and commerce of these regions, as well as in the formulation of plans for the improvement of the conditions of life among these peoples. I have therefore indorsed the recommendation of the Director of the Office of Experiment Stations that a special appropriation of $5,000 be made to enable this Department to undertake studies of the food supply and consumption of people living in the Tropics.

IRRIGATION INVESTIGATIONS.

The irrigation investigations conducted through the Office of Experiment Stations have been extended during the past year as far as the appropriation of $50,000 would permit. These investigations have

followed two general lines in accordance with the terms of the appropriation act: (1) Studies of irrigation laws and the social and industrial institutions of irrigated agriculture; (2) investigations of the methods by which water is conserved, distributed, and used.

IRRIGATION LAWS.

The significance of the facts disclosed by the study of irrigation laws can be appreciated only by those familiar with Western conditions, which are in striking contrast to those of the East. In the East moisture comes from the clouds; in the West farmers must secure it from other sources. In the East irrigation may supplement rainfall; in the West it must take its place. Not only is the availability of streams for irrigation the measure of settlement, but the character of the social and industrial life of those who depend upon them will be profoundly influenced by the laws and customs which govern the ownership and control of water.

The most impressive fact connected with irrigated agriculture is the dominating influence of streams on the peace and success of cultivators of the soil. The character of the titles to water finally recognized will do more than all other influences combined to determine whether Western farmers are to be tenants or proprietors. This makes it of vital importance that the disposal of the water resources of the West should be hedged about by every safeguard which experience can suggest. Every consideration which justified the General Government in organizing a bureau for surveying, mapping, and disposing of the public lands applies with equal force to the orderly and just establishment of titles to water by public authority, either State or national.

Unfortunately, however, the importance of this was not recognized at the outset, hence the management of the public land has no counterpart in the disposal or division of Western rivers. Whoever desires to acquire public land can learn from official records just what land is open to entry and what has been disposed of. The need of reliable information regarding the amount of water appropriated and the amount still remaining under public control is more urgent, because men can see with their own eyes what lands have been settled upon and improved, but the appearance of a river gives no clue to the ditches which divert it 50 or 100 miles above or the claims which may be filed on its waters below.

Thus far all of the laws governing water rights in irrigation have been passed by the States, and all of the titles to water thus far established are either the creation of State statutes or the results of decisions of State courts. A few States have enacted enlightened codes of water laws. In these the water-right records are a reliable guide to those seeking to irrigate land and a protection to those who have already done so; but there are other States where investors in irriga-

tion works and incoming settlers must depend on what they see or on the statements of other settlers in determining what is their prospect for securing the water supply needed in irrigation. Neither of these sources of information can be relied upon. As a rule, those who have rights to water do not encourage the filing of additional claims and are inclined to say that all the water is appropriated, while newcomers are inclined to believe, if there is any water running in the stream, that it is open to their use. The tendency, therefore, is to build more ditches than the stream will serve, but it is especially marked where conditions for ditch building are favorable. As there are no limitations on the number of claims which may be filed or the number of ditches which may be built, the establishment of new rights goes on until there is not water enough to fill all the ditches, when controversies and conflicts inevitably arise. For such conflicts the only means of settlement thus far provided is a resort to force or the courts. In the States where rights to water are determined by ordinary suits at law, litigation is almost continuous and is exceedingly burdensome. It too often happens that such suits, instead of settling the nature of water ownership, only create new issues, which in turn burden the courts and impoverish water users.

This condition of affairs should not continue. The growing demand for water for irrigation purposes, the greater needs of cities and towns for domestic uses, the importance of streams in the generation of power, are making it absolutely necessary that some simple and final method of determining and protecting rights to streams shall be provided. This Department is lending all the aid its means will permit to bringing this about, and with most encouraging results. No feature of these investigations has met with more appreciative recognition than the study of water-right problems, and the meritorious character of the laws enacted last winter by several arid States and Territories shows that the Department's work is bearing fruit. The importance of these investigations is not to be measured, however, by results already achieved, but by their influence on the future social and industrial life of the West.

The report on irrigation in California recently published by this Department presents an impressive picture of the manner in which development has been hampered by lack of adequate water laws. The chaotic and conflicting records of claims, the uncertain limitations on riparian rights, and the failure to protect all rights by the public division of the water supply in times of drought has been a source of anxiety to the user and of expense and loss to the not less worthy owner of ditches and canals. The marvelous natural advantages of the State have been sufficient to offset these drawbacks, but the larger and better use of water in the future is dependent upon their removal. Especially is this true if the Government is to construct irrigation works.

Under present conditions no one knows who would control the water made available by public funds. No one knows whether the needy user or the speculative holder of a water title would reap the benefits of this expenditure. The report on irrigation in Utah, soon to be published by this Department, shows with equal clearness the need of laws to insure stability and justice in the distribution of the water supply. These reports will be followed by similar investigations in other arid States. They will present the facts. With these before them the people of each State can determine what action, if any, is required.

Reform in irrigation laws will be final and satisfactory only when it comes through the enlightenment of the people most concerned. In a matter so vitally affecting the home as the control of the water supply no legislation will be effective which has not the sanction of the irrigators themselves. As yet, this kind of agriculture is new and its requirements are only imperfectly understood. Material development has outrun the creation of institutions necessary for its protection. The last is the most difficult problem, and it is the one now directly before us. The possibilities of irrigated agriculture are so great that everything which will contribute to its largest and best development is a matter of national interest. We are now in the momentous years when institutions are forming, and the labors of this Department to foster tendencies in the right direction and to correct mistakes before they have become fixed by time and custom should be continued. What is done now affects not only the present generation of irrigators, but will vitally influence those of the distant future.

DISTRIBUTION AND USE OF WATER.

The design and improvement of instruments for measuring the water used in irrigation have received the further attention of the experts employed in this work, and have resulted in registers being furnished to irrigators at about one-half the cost of foreign instruments made for this purpose. Accurate measurement of water tends to promote economy, because it enables farmers to know whether they are receiving what they pay for and canal companies to check wasteful use wherever it occurs.

In addition to improving instruments for measuring the depth of water flowing in canals, a station has been established at Cheyenne, Wyo., for rating current meters and testing water registers. This station has been of marked service to the irrigation interests of the surrounding States.

The studies of the duty of water have been extended so as to embrace all the problems of a river. The results show that the volume of water required to irrigate an acre of land along some parts of a stream will irrigate two or three acres in other places. They also show the need of preliminary study of this subject in order to rightly locate ditches and

canals. The water supply in the same river gains in some places from seepage and loses in other places. An illustration of the change in volume due to this action was shown last season by Snake River, in Idaho. At one place in its course it carried enough water for 200,000 acres of land. Forty miles above it was dry. Nothing had been added to it by surface streams in the intervening distance. Where it was dry the water had sunk into the sand; farther down it reappeared on the surface.

The studies of evaporation and seepage have been extended in order to show more clearly the extent of the losses from canals from these sources. Much interest is being manifested in these investigations by managers of canals. Definite information on the subject is needed by those who are planning new works and to enable the managers of the old ones to distribute their water supply to the best advantage.

The operation of canals which divert streams flowing over sandy beds, or which are heavily charged with silt, has proven a source of great perplexity to those in charge, and the influence of sediment in the maintenance of reservoirs deserves careful consideration in the location of these works. Much valuable information on this subject has been gathered during the past year.

In some of the older irrigated districts the percolation of water from canals, or its wasteful use on fields, has created bogs and marshes on the lower lands. To make these over-watered fields again productive drainage will have to supplement irrigation. The plans for drainage should be made, like those for the original watering, on a comprehensive plan. The individual irrigator can not drain his own farm without the cooperation of his neighbors. Plans for effective cooperation are needed, and the aid of this investigation has been asked in their preparation.

IRRIGATION IN HUMID SECTIONS.

Interest in irrigation in the humid regions of the United States is constantly growing. This has been stimulated throughout the Middle West by the drought of last summer, and in the South and Southwest by the success of the rice industry. In the State of Louisiana more miles of irrigation canals have been built and more money expended on pumping plants during the past two years than in any arid State. The application of irrigation in growing rice in Louisiana and Texas has made land worth originally from $5 to $10 per acre worth $50 to $100 per acre, and promises to enable the United States to become an exporter instead of an importer of this important food product.

A recognition of the increased interest in irrigation in the East has caused this Department to extend its investigations in this part of the country. The experiments being made by Prof. R. C. Waters, of the Agricultural Experiment Station of Columbia, Mo., are attracting

wide attention in that State, while the investigations of Prof. F. H. King, of the Agricultural Experiment Station of Wisconsin, at Madison and Stevens Point, and of Prof. Edward B. Voorhees, of the Agricultural Experiment Station of New Jersey, will serve to show the value of irrigation in securing larger yields and providing an insurance against drought. The indications are that irrigation is to have a wide field of usefulness in many sections where it is not a necessity. Especial attention has been paid during the past year to the subject of rice irrigation, and a comprehensive report dealing with the methods of application, the cost of water, and the value of the product will soon be ready for distribution.

The fact that the United States is destined to become one of the leading irrigated countries of the world makes it especially desirable that the laws which control the ownership of streams and the methods of applying water should represent the best thought and experience of our time. Nothing can be more foolish than to continue to learn experimentally for ourselves what is already known elsewhere. The lessons of southern Europe should be placed before the growing communities of the West through reports of experts familiar with our conditions, and who can thus compare their methods and ours. The first of such investigations, embracing Italy and Egypt, is now being carried on.

In no year since Western settlement began has the prosperity of the irrigated farm been as marked as during the one drawing to a close. The high prices of cattle and sheep have contributed to the profits of the grower of forage crops. There has been a ready market and good prices for all the surplus products of the irrigated farm and garden, and these high prices have been accompanied by an almost uniform record of large yields.

AGRICULTURAL ENGINEERING.

The prosecution of these investigations has led to the study of a number of affiliated subjects, the relation of which to irrigation becomes apparent only with a thorough understanding of the situation. In one way or another the whole subject of agricultural engineering is involved. Especially is this true of the applications of power to farm work. The subject of pumping will serve as an illustration of this relation. In many places pumping furnishes the most economical and readiest means of securing a water supply. Farmers desire to avail themselves of all the experience of others before wasting any money in gathering it for themselves. Hence this Department is called on for information as to the amount of water required for a given acreage, the size of pump needed to furnish it, the cost of pumping for different depths, the kind of power to be applied, whether steam, wind, gas, water power, or electricity, the cost of machinery, the expense

of its operation, and, in general, all the aid this Department can furnish in determining in advance whether or not this kind of irrigation will pay.

The commercial importance of these inquiries can be understood only by those who realize the immense sums of money which in the last two years have been invested in pumping projects to furnish water. In the rice fields of Louisiana alone several hundred thousand dollars have been expended. This work is as yet in its experimental stage, and this Department is doing a very useful service in answering these inquiries. Another illustration of the manner in which the investigations in irrigation are naturally going into a broader field of agricultural engineering is shown in the way studies of the problems in irrigation engineering have to be supplemented by a knowledge of drainage engineering. Questions are also constantly arising regarding systems of water supply and sewerage of farms and the methods of engineering which will best promote the sanitary welfare of our agricultural people. Many inquiries are coming from Eastern States for information regarding the construction of reservoirs and advice about the handling of water in order to prevent the destructive erosion of hillside farms. We are beginning to realize that the wasteful methods of tillage employed during the conquest and settlement of this country must now give place to more scientific methods, which will restore what is lost as well as preserve what remains. In many parts of our country efforts are being made to improve the conditions of rural, as well as city and village life, by beautifying the environment of the home and the community through attention to the artistic laying out of gardens, lawns, large estates, and parks. For the performance of this work in the best manner the services of expert agricultural engineers are required, and already we find here and there engineers who are giving special attention to these subjects. In various other ways the aid of the Department is also being invoked. Without doubt, agricultural engineering is destined to have as useful a place in this country as it already occupies in European countries, and it is time that the Department should occupy this field of research and aid in the development of our agriculture along this line.

NATIONAL AID FOR IRRIGATION.

There is every reason to believe that irrigation will, in the near future, become a subject for legislation by Congress, and there are important reasons why it should have the attention of that body. Hereafter the seekers for homes on the public domain must look for them in that part of the country where cultivated crops can not be grown by the aid of rainfall alone, and where the extent of irrigation is the measure of settlement. It has been the policy of this country in the past to dispose of its public lands on liberal terms, in order that men

of limited means could be enabled to establish themselves thereon. If this policy is to be continued, more favorable conditions for the reclamation of the remaining irrigable public land must be provided. The largest volumes of unappropriated water now existing are to be found in the great rivers of the West, of which the Missouri, the Colorado, and their more important tributaries are the notable examples. To make these streams available, costly and enduring dams and long and expensive main canals must be provided. If the outlay for these is to be added to the expenditure which each settler must make in building his lateral ditches, putting his land in condition for cultivation, and supporting himself and family during the period of this preparatory labor, the expenditure will be prohibitive for all except men of considerable means. Because of this, agricultural development in the West has for several years been slow, and the period of rapid progress has probably passed, even under the most favorable conditions which can be provided.

The desire of the West is not solely, however, for a more rapid agricultural growth, but a more satisfactory one. The uncertain character of water rights has already been referred to. It is the belief of those best informed that this can be remedied only by a larger measure of public control and the making of certain classes of irrigation structures permanently public works. Among the irrigation works which belong to this class are diverting dams of such size and importance as to influence the safety of all who live below them, the main trunk canals of too great magnitude and cost for private enterprise, and reservoirs built in the channels of streams used for irrigation. The argument in favor of making such reservoirs public works is that they should not be owned by private parties because the distribution of water from them, in connection with the ordinary flow of streams, creates complications which should be averted. As their chief utility is to make possible a larger and better use of the water supply by storing the floods and supplementing the streams during the periods of drought, the same argument which justifies the setting aside of forest reserves and the payment of salaries of men to patrol them applies to the construction of reservoirs by Congress. The purpose in each case is to conserve and render available the water resources of the West.

The appropriation of money by Congress to construct any of these classes of irrigation works will bring this country face to face with a new governmental policy. Thus far we have left the diversion of streams to private ownership. The construction of public works with either State or national funds means practically a reversal of this policy and carries with it a larger measure of public control over the water resources of the West than has hitherto been practiced or sanctioned by public sentiment.

Congress, in dealing with this matter, will have to consider the man-

ner in which aid can be most effectively extended, as well as to determine the amount of such aid. It must be borne in mind that we are not at the beginning of irrigation development. Over two hundred millions of private capital has already been invested in the construction of irrigation works. The rights to streams already acquired represent many additional millions. The methods and customs by which these properties are operated and rights to streams established are the result of an evolution local in character; hence they differ widely in the different States. An illustration of the situation which prevails is furnished by the South Platte River and its tributaries in Colorado. There are over a thousand separate and distinct rights to the water of this stream. Some of these rights serve to irrigate over a hundred farms. The water right of one canal provides for the irrigation of over four hundred farms. Practically all of these thousand appropriations have reference to a common supply. Each right has a different rank, and the division, extending over thousands of miles of the main stream and its tributaries, must be carried out with reference to relative priorities. Such a division is a complex and difficult problem. It has required nearly half a century for the people of this section to solve it and devise a working system, but as a result of their experience each irrigator has come to understand his own rights and those of his neighbor, and has learned what to expect when the stream is low and what he can rely upon when it is high.

It is a question whether any appropriations which Congress might make for the construction of additional works in this district would not inflict more injury than benefit if such construction carried with it any disturbance or interference with the existing system, which people understand and to which they are attached.

The water laws of Colorado differ from those of other States. In Utah rights are established in a different manner and are of a different character, and these rights are enforced by a different body of officials. There are still other differences in Wyoming, and much more striking differences in California. This does not mean that any of these systems are entirely satisfactory. All would be improved by modification, but the change from present conditions should be made only when the people whose interests are at stake are ready for it.

The passage by Congress of any law giving the General Government control over irrigation in the West would mean, first of all, the employment of a large number of new officials and the formulation of an administrative policy to take the place of those now existing in the States. It would impose upon national officers the duty of determining what claims to water should be recognized and those which should be disregarded. As State laws differ from each other, any plan which Congress might adopt would have to be revolutionary in some States. If it were certain that the National Legislature would devise a

just and effective system which would operate everywhere alike, the unsettling of existing conditions might not be so objectionable, but there is no such assurance. All who have studied the subject agree that, notwithstanding the imperfections of State laws, it would be a mistake to attempt reforms by an arbitrary exercise of power from without, but that the true solution is to educate irrigators as to their highest interests.

If the States are to control the water supplies, there should be satisfactory assurance that whatever is made available by public funds shall benefit the actual users of water and not enrich the holders of speculative rights. In some States there is such assurance. These States are entitled to national aid, because it is known from present conditions that such aid would be clearly beneficial. But there are other arid States where the doctrine of riparian rights jeopardizes the success of every irrigation work now built, as well as any works which the Government might build. In other States rights have been established to many times the existing supply, yet there is nothing to prevent new claims being filed, new diversions made, and unending litigation over the conflicts thus created. For the Government to provide an additional supply on these streams before existing controversies are settled would simply aggravate and intensify the evils of the present situation. Whatever aid Congress extends should be conditioned on the enactment of proper irrigation codes by the States, and be made to promote the greater efficiency and success of such laws rather than interfere with their operation.

INFLUENCE OF LAND LAWS ON IRRIGATION DEVELOPMENT.

The irrigation problem of the arid West is not, however, one of water alone, but of land and water. The character of the laws which control the disposal of the 500,000,000 acres of arid public land can not but have a vital influence on the rapidity and success with which irrigated agriculture is extended. The management of these lands is a great economic trust of the nation and affords one of the highest tests of the capacity of the Republic to deal with problems of this character.

There are several directions in which land legislation can be made to promote agricultural development. Laws to protect investments of private capital in irrigation works are urgently needed. Many of the losses experienced in the past by the builders of large canals have been due to misfit land laws. The reasons for this are well understood in the West, but apparently not realized elsewhere. One has been the injury wrought by speculative filings on the land to be irrigated. The building of a canal enhances the value of the land it covers from that of grazing land to that of farming land. With a few exceptions this increase in value is at least tenfold. Under former public land laws it was possible to make filings without any outlay

except land-office fees or without making any substantial improvements, hence every canal survey has been the signal for a rush to the land office to file on the country to be watered. A majority of those making these filings were not actual settlers, but speculators seeking to make money by selling out their claims to the ditch company, or later to those who actually wished to farm the lands.

While all the land laws were doubtless intended to benefit settlers, they have in practice, in the arid region, too often benefited speculators. Hundreds of filings made under the desert, preemption, homestead, and timber-culture acts have been made by people who never were farmers and never expected to become farmers. It is to such filings that scores of meritorious irrigation enterprises owe their failure. The repeal of the preemption and timber-culture acts, and cutting down desert land entries from 640 to 320 acres, has improved the situation, but it can be still further improved by an entire repeal of the desert-land act and by requiring settlers on homesteads to cultivate as well as to live on their farms. The desert act was an economic mistake. Six hundred and forty acres is more arable land than a man of moderate means can cultivate under irrigation.

GRAZING LAND.

Surrounding the irrigable valleys are vast areas of grazing land which can never be cultivated because of lack of water, or because the surface is too broken for irrigation. Although a single acre produces little forage, the aggregate value of the pasturage is very great, and large sums of money and many men are employed in the range stock industries. Probably 400,000,000 acres of the public domain has no agricultural value except for pasturage. At present it is an open common with no laws for its protection or its disposal.

The question to be considered is whether this lack of the control of the grazing lands is an injury or an aid to the irrigation development. That it must exert an important influence can scarcely be doubted.

In sections remote from railways or local markets the prohibitive cost of transportation renders the growing of farm products for sale unprofitable. These products must be consumed where raised, and the only product that can be so consumed is winter feed for stock, and this in turn requires stock to consume it. Many irrigable areas are 50 or 100 miles from a railroad station. The use of grazing lands is as essential to successful irrigation of these areas as control of a water supply, but so long as there is no law giving secure tenure on grazing land the farmer under irrigation is subject to the danger of having his home pasturage eaten up by some nomadic flock or herd. This frequently occurs, and the gravity of the conflicts it provokes is serious. During the summer months not a week passes which does not witness an armed encounter either between settlers and range stockmen or

among the range stockmen contending for the control of the same grazing area. If, instead of this uncertain and uneconomic system, there could be a law for the control of the grazing land which would unite with a small homestead of irrigated land a larger but limited area of grazing land, thus enabling each farmer to raise his winter feed supply on his irrigated land while keeping his stock on the grazing lands in summer, the value of irrigation works would be much enhanced and a great incentive given to development by private capital.

The purpose of such union of the irrigable and grazing lands would be to divide the grazing land into a multitude of small holdings and thus increase the number of people benefited by it; to give security of tenure, which will make the growing of live stock attractive to many who are now repelled by the risks and controversies of the open range; to give increased value to irrigation, and provide the conditions indispensable to success in many localities. Such a land system would also encourage the introduction of improved breeds of stock, because it would afford better opportunities to care for them. At present there is little inducement to such improvement, because of lack of control over the country occupied. It would enlist self-interest in the improvement, or at least the preservation, of the native grasses, where every influence now tends toward their destruction.

Such a union of the irrigable and grazing lands would cause the building of fences and the making of other improvements far beyond the limits of irrigation. It would attach settlers to the pastured areas as closely as they are now wedded to their irrigated fields. It seems to possess many advantages over the present system, or lack of system, if a satisfactory law can be enacted bringing it into operation. Whatever is done, no obstacle should be placed in the way of homestead settlement, but this does not seem to offer any special difficulties. In the first place, the grazing area should be leased and not sold. The possibilities of its utilization have not yet been determined, nor is enough known to fix definitely the limits of a grazing homestead. The leasing of the grazing land in such a way as not to interfere with the homesteader can be accomplished in one of two ways: Public lands can be classified and the boundaries of irrigation and grazing defined, or the grazing land can be leased subject to entry under the public land laws. Even under such restrictions it is believed that the greater part of the grazing lands can be leased, and the rentals therefrom would amount in the aggregate to a very large sum. This could appropriately be applied to the reclamation of the irrigable lands. It would be taking nothing from the revenues of the nation, because it would come from the better use of a resource which now produces nothing.

There are also many things to commend the expenditure of the revenues derived from the sale of public lands to the construction

of irrigation works. Such an expenditure will enhance the value of the remaining lands, open up larger areas to settlement, and add to the material wealth of the country in a much larger measure than will the retention of these lands by the Government in their present condition.

The leasing value of the grazing lands has been demonstrated in a number of arid States. When Montana, Wyoming, Washington, and Idaho were admitted to the Union, a condition was attached to the donation of State lands which prevented their sale for less than $10 an acre. This was a prohibitive price, as the adjoining areas of public land could be acquired for nothing under the homestead act. Hence the only way a revenue could be derived was through their rental. As the greater part of these lands are comprised in sections 16 and 36 and only represent the value of pasture lands, they afford a fair indication of the rental possibilities of the grazing areas. The following table shows what has been done by several States in this matter, and is a significant indication of what is being lost through lack of management of the public lands of this character:

Summary showing results of leasing State lands in some of the arid States.

State.	Total area of State lands undisposed of.	Acreage under lease at close of last fiscal year or biennium.	Total rents received.	Average rental per acre.
	Acres.	*Acres.*		
Colorado	2,639,938	1,251,770	$103,121	$0.082
Idaho	----------	32,271	23,050	.614
Montana	----------	995,912	112,467	.112
Nebraska[1]	2,483,372	1,879,143	----------	----------
Utah	----------	106,531	6,300	.059
Wyoming	----------	1,969,945	80,841	.041

[1] Total receipts for biennium ending November 30, 1900, for interest, rentals, bonus, etc., were $782,975.65.

In addition to these State rentals, the Union Pacific Railway in 1900 rented 428,800 acres in Wyoming and 667,520 acres in Colorado, and the Northern Pacific Railway leased over 1,000,000 acres at rentals varying from 2 to 7 cents per acre.

CONCLUSIONS REACHED.

During the past summer and preceding summers I have given much time to a personal investigation and study of the land and water problems of the West, and have reached the following conclusions regarding them:

(1) That private enterprise will have to be supplemented by public aid in the construction of certain classes of irrigation works if we are to secure the largest development of Western agriculture.

(2) That reservoirs located in the channels of running streams should be public works.

(3) That the first step toward national aid for irrigation should be the passage of enlightened codes of water laws by the States to be benefited.

(4) That the land laws should be modified by repealing the Desert Act and by requiring cultivation as well as residence on a homestead.

(5) That the nonirrigable grazing lands should be leased in small tracts so as to unite the irrigable and the pasture lands.

DIVISION OF ENTOMOLOGY.

The principal work accomplished by the Division of Entomology during the fiscal year ended June 30, 1901, is as follows:

ESTABLISHMENT OF SMYRNA FIG GROWING.

The practical completion of the investigations which resulted in the introduction and establishment in California of the fig-fertilizing insect (*Blastophaga grossorum*). An assistant was sent to Fresno in 1900, remaining there throughout the season, making observations which completed the life history of the insect and resulted in the ascertaining of important facts previously unknown, although in southern Europe the insect had been known and studied for very many years. He also took active part in the practical work of handling the insect and fertilizing the crop. Eleven tons of Smyrna figs were raised, dried, and placed on the market, and tests made by chemists and fruit experts show these figs to be superior to the imported product. The insects were successfully carried through the winter of 1900-1901, many of them hibernating successfully without cover; and, although not coming under the head of the fiscal year in question, it may be interesting to add that in the autumn of 1901 the crop of Smyrna figs was so abundant as to be difficult to estimate. Certainly more than 50 tons were gathered, and the full crop may possibly have reached as high as 75 tons. The fertilizing insect has been thoroughly established at several other points than Fresno, and the Division of Entomology now holds itself in readiness to see that a supply of the fig insects is furnished to any fig grower after he has succeeded in raising to the bearing stage caprifig trees and Smyrna fig trees.

WORK AGAINST THE SAN JOSE SCALE.

Several predatory insects have been imported from different foreign countries, and good results to American agriculture are expected. The most important of these will doubtless prove to be an enemy of the San Jose scale, which has been brought over from China.

Ever since the appearance of the San Jose scale in the United States the question of its original home has been a mooted one; and, since none of the parasitic and predatory insects of this country seem to be very efficient in destroying this scale, it has become an important point to decide, if possible, the question of the original home of the destructive insect, since it is quite fair to suppose that if efficient parasites are to be found they will be found in the original home of the scale. The importance of this quest can hardly be overestimated, since the damage which the San Jose scale has done to the fruit-growing interests of the country, especially of the Eastern States, is almost beyond estimate.

The evidence accumulating during the past two or three years nad seemed to show that very possibly this scale was originally imported into this country from Japan, and in the spring of the present year the assistant entomologist, Mr. Marlatt, was sent to Japan for the purpose of studying the question on the ground. Unexpectedly to most entomologists, although not to the entomological force of the Department of Agriculture, it was quite definitely ascertained that the San Jose scale is not indigenous to Japan, but that, quite to the contrary, it was introduced into that country from the United States upon fruit stock at several different times and at several different points. The most careful search failed to reveal the scale in portions of Japan where American plants had not been introduced. Mr. Marlatt's travels in the Japanese Empire lasted about five months, and having satisfied himself, as just stated, he proceeded to China, visiting Chefoo, the port of the great foreign fruit district of North China, where the industry was started by a missionary (Dr. Nevins) some thirty years ago, since which time it has extended over the province. Foreign fruits were introduced and are now grown alongside the native fruits or grafted on native trunks. The San Jose scale was found there, but the admixture of foreign trees with the native trees prevented any conclusion as to whether the scale was indigenous or not. Proceeding to Pekin, he found the fruit markets enormously stocked and representing exclusively the products of the surrounding country and districts south of and adjacent to the Great Wall. All the fruits were native. The apples were small, and the pears were hard and woody. Nearly all this fruit was infested by the San Jose scale.

At Tientsin the same conditions were found in the fruit markets, and in the city gardens and private yards the San Jose scale was found on a flowering shrub coming from North China. In all the region between Tientsin and Pekin and the Chinese wall native fruits only are grown, and no foreign stock of any kind has ever been introduced. Apples, pears, peaches, apricots, and plums are extensively grown on the sunny slopes of all the hills south of the Great Wall. The San

Jose scale in this district could not have come from any foreign country, as there have been no importations and the fruits are all of native sorts. The scale occurs very scatteringly, although generally, just as it should if native, and is in a state of balance with its native natural enemies. It has a natural enemy, everywhere present and efficient, in a ladybird beetle known as *Chilocorus similis*. From this evidence Mr. Marlatt concludes without doubt that the San Jose scale is a native of North China. He has collected many specimens of this efficient natural enemy and has forwarded them to Washington. Steps will be taken to establish and acclimatize this important species, and it is hoped that it will prove as efficient against the San Jose scale in this country as it has in its native home. It is not beyond the bounds of probability that this importation will prove to be one of extreme value to the fruit growers of the United States.

BLACK SCALE, PLANT LICE, AND GRASSHOPPERS.

Possibly the next most important of these beneficial insects which have been introduced is a caterpillar enemy of the black scale, which has been brought over in healthy living condition from Italy by the assistance of Prof. Antonio Berlese, of the Royal School of Agricultural Entomology at Portici. The black scale is a serious enemy to olive culture in California. It occurs not only upon the olive but also less abundantly upon citrus trees, upon a shade tree known as the pepper tree, and other plants. It is the greatest drawback to olive culture in this country. The caterpillar in question (*Erastria scitula*) is found in Mediterranean regions, and is probably one of the principal causes of the comparative freedom of olive trees from black scale in that part of the world. The Division of Entomology has for eight years been attempting to bring this insect to the United States in living condition, and success for the first time was reached in November, 1901. This beneficial insect will be established in California with the assistance of the State board of horticulture of that State. It should be stated that the black scale is apparently a native of the general region from which this beneficial insect has been sent.

Another importation which may also prove to be an important one is a ladybird beetle, known as *Coccinella septempunctata*, which has been brought over from Hungary with the assistance of Prof. Charles Sajo. This insect, native to Europe, feeds upon several destructive plant lice which have been accidentally imported into this country from Europe, and upon the larvæ of the destructive asparagus beetles.

A fungous disease of grasshoppers has been imported from South Africa and has been experimentally used in different places in the United States through the summers of 1900–1901. In some localities it appears to have taken hold successfully, but it is too early as yet to predict any general success.

WORK OF LESS IMMEDIATE IMPORTANCE.

The other work may be summarized as follows: Studies of the insects affecting the violet, rose, and other ornamental plants have been completed. Extensive work has been carried on in regard to scale insects and experimental work with remedies has been conducted. The subject of the investigation of insects as carriers of diseases of human beings has been carried on, and much attention has been given to mosquitoes and house flies in this connection.

In cooperation with the Bureau of Soils, some work has been done looking toward the reclamation of brackish marshes which are breeding places of mosquitoes, and the studies of flies have indicated not only the importance of these creatures in the carriage of internal diseases, such as typhoid fever, but have indicated the cheapest and best remedies. Observations on insects affecting forest trees have been carried on during the year, and extended studies have been made of the codling-moth problem in the Northwest and of the Mexican cotton-boll weevil of Texas, information being obtained in both cases which promises practical results of very considerable importance. Extended studies were made during the summer of 1900 of the insects affecting citrus trees and fruits in southern California and a practical article detailing results was published in the Yearbook for that year. Experiments with remedies were conducted that included a series of experiments with washes against the scale insects and with fumigants both against scale insects and in storehouses, granaries, and tobacco establishments. An investigation has been made of a supposed insect damage to the cocoa-palm industry in Cuba. In apiculture comparative tests have been made of different races of bees and of methods employed in rearing queen bees.

WORK OF 1902.

Work for the fiscal year 1902 is already well under way. The investigation of the codling moth in the Northwest, as authorized by Congress, and of the Mexican cotton-boll weevil in Texas, also authorized by Congress, will be carried on through the whole year. The South African grasshopper fungus will receive further severe practical tests. Search for the original home of the San Jose scale will be continued. Advisory work with regard to the extermination of breeding places of mosquitoes will be continued, as well as many minor lines of inquiry.

OFFICE OF PUBLIC ROAD INQUIRIES.

OBJECT OF THE WORK.

In the establishment and maintenance of this Office the object has been to promote the improvement of the public roads throughout the United States. With that end in view, efforts were first directed to

ascertaining the condition of the roads, the state of public opinion in regard to their improvement, the obstacles in the way, and the best means and methods to be employed in securing better highways. Efforts were next directed to furnishing information in order that the people might be educated on this question, and to arousing interest and forming public opinion in order that practical results might be secured. Work along all these general lines has been continued up to the present.

PUBLICATIONS.

For several years after this Office was created its principal work consisted in collecting, publishing, and distributing information. This was embodied in a series of bulletins and circulars covering almost every phase of the road question. Of these publications hundreds of thousands of copies have been distributed. Some of them have been reprinted several times, and nearly all of them are still available for distribution.

The literary branch of the Office's work is still receiving careful attention, but it is no longer the principal line of work, greater attention now being devoted to educational work of a more concrete and extremely practical character.

OBJECT-LESSON ROADS.

For spreading information and arousing interest, there is nothing equal to the practical object lesson. The Office of Public Road Inquiries has been trying to show the people the best in the good-roads line.

During the past year "object-lesson" or "sample" roads have been built in nine States. While these have not been built at the expense of the Government, nor on the initiative of the Office of Public Road Inquiries, they are the fruits of its efforts. The Office simply accepts invitations from organizations and communities to give cooperation and technical advice in the making of these sample roads.

Work of this kind produces excellent results. The demand for its extension is far greater than the Office, with its present force and means, can meet.

In the building of sample roads heretofore the machines have been loaned by manufacturers, and the railroad companies have carried them free of charge. The local community has furnished the labor and material, and the Office of Public Road Inquiries has given expert advice and supervision. The Government could, at comparatively small expense, purchase the machinery necessary for continuing and extending this work, and it seems appropriate that it should do so, thus putting this very important branch of the work on a firmer foundation.

ROAD MATERIAL LABORATORY.

The laboratory for testing the chemical and physical properties of road materials, operated with the collaboration of the Bureau of Chemistry, has been in successful operation during the year. By determining in advance the character and suitability of the material to be used in a road, this laboratory saves taxpayers the loss and discouragement resulting from mistakes in selecting materials. This work is important and practical. It will be continued and if possible enlarged.

OTHER PRACTICAL WORK.

The dividing of the United States into four divisions, with a special agent appointed for work in each, has proved advantageous. The work done by these special agents consists principally in the study of conditions, the delivery of lectures, correspondence, and preparation of matter for publication. In the Eastern Division no field work has been done because the special agent assigned to that work was placed in charge of the road-material laboratory. In the other divisions—Middle, Western, and Southern—much better results might have been secured if the Department could have kept these special agents employed all the time. This was impossible owing to the inadequateness of the sum—only $1,500 for each division—available for the payment of all expenses.

A great amount of valuable field work has been done by the Director and his assistants during the year. They have traveled thousands of miles, attended conventions, delivered lectures, and directed the building of sample roads. Their work has reached into 23 States.

The work of this Office is of great and growing importance. Popular appreciation of its efforts has greatly increased, as shown by press comments and resolutions adopted by many popular gatherings. The demand for the services of the Director and his assistants far exceeds the limits of their time and energy. There is an unmistakable popular demand that the Office of Public Road Inquiries be given a largely increased appropriation, a demand with which I am in hearty sympathy. If a larger sum should be appropriated for this purpose I believe it would be profitably expended in carrying on and extending the work of this Office.

DIVISION OF PUBLICATIONS.

In the performance of its duty to diffuse the information acquired through its several Bureaus, Divisions, and Offices the Department depends mainly upon the issue and distribution of publications. The work of the Division of Publications affords, therefore, a fair reflex of the activity and intelligence characterizing the investigating

branches of the Department, and for this reason it is important to observe that the extent of the work devolving upon it is dependent entirely upon agencies outside of the Division and beyond the control of its chief.

It is obvious, therefore, that every step taken in the development and extension of the work of the Department increases the work of the Division of Publications, and yet it must be admitted that the provisions made for the publication work and the distribution of the Department publications have never been fully adequate to the task imposed upon it. The result has been, unfortunately, that every year important reports have been withheld from publication, either until a new fiscal year has brought with it new appropriations, or until a resolution could be passed by Congress specially authorizing their publication and assuming the cost thereof. It is of the highest importance that our publications should be timely and that the practical results of investigations made—all useful information, in fact, acquired by the Department—should be promptly given to the public. These delays are not infrequently costly and are at all times vexatious. Again, in the matter of distribution, the distributing force, largely underpaid as it is, is frequently disorganized and demoralized by suspensions and furloughs necessitated by want of funds, to say nothing of grievous hardship thus imposed upon many hard-working and faithful employees. Not less than 35 persons suffered in this way last year, in spite of the fact that $5,500 of this year's appropriation was made immediately available, and it has become necessary again this year not only to ask for a very considerable increase in the force but to have a considerable sum again made immediately available in order to carry on the work efficiently to the close of the present fiscal year.

GROWTH OF THE PUBLICATION WORK.

In spite of the restrictions thus imposed upon the work of publication, it has nevertheless grown wonderfully during the past ten years. In 1893 there were issued from the Department 210 publications, aggregating over 2,500,000 copies. In the year under consideration, 1901, there were issued 606 publications, aggregating nearly 8,000,000 copies.

FARMERS' BULLETINS.

Of the above publications 3,345,000 copies were Farmers' Bulletins, of which 2,200,000, in round numbers, were distributed under Congressional orders. The total number of Congressional quotas drawn was 413. With the accumulated copies due to quotas undrawn and the increased appropriation for the Farmers' Bulletins the quota for each Senator, Representative, and Delegate for the current year has been fixed at 15,000 copies. Under the present law four-fifths

instead of two-thirds of all copies printed are available for Congressional use, and to satisfy both the Congressional and the Departmental requirements will necessitate an issue of Farmers' Bulletins aggregating a number of copies almost equal to the entire output of all publications of the past year. It has been necessary, to meet this greatly increased demand on our resources, to lease a building in the vicinity of the Department to be exclusively devoted to the storage and shipment of Farmers' Bulletins. This makes the fourth building occupied, in whole or in part, by the Division of Publications.

RELATIVE COST OF EDITORIAL WORK.

It is proper to call attention to the fact that in proportion to the total output of publications and the amount expended for actual printing, the expenses of editing, illustrating, and distributing the publications, and of the clerical work involved in the disposal of the immense mass of correspondence devolving upon this Division, as the result of the nearly 300,000 applications for publications received during the year, amount to very much less proportionately than was the case ten years ago. In fact, at no time since the Division was organized has the cost of editing, illustrating, distributing, and of the clerical work been so small in proportion to the actual cost of printing and the number of publications distributed.

THE YEARBOOK.

The Yearbook of the Department continues to be in great demand. It is difficult to keep it within the limits of a convenient book, owing to the immense variety of subjects covered by the work of the Department, which should be represented in it; also owing to the mass of important information, statistical and otherwise, which finds a place in the Appendix, and which, as far as I know, is not available elsewhere. Under these circumstances the propriety of issuing the Yearbook in two volumes, the first to consist of independent articles contributed by the various bureaus, divisions and offices, and the second of the Appendix, presents itself as worthy of consideration.

The Department is subjected to great inconvenience by the smallness of the number of copies of the Yearbook placed at the disposal of the Secretary, and a more liberal allowance is urgently needed to supply the demands for this publication. When the total number of copies of the Yearbook issued was but 300,000, and when the work of the Department was not one-fourth of what it now is, 30,000 copies were allowed the head of the Department, then Commissioner of Agriculture. To-day, with 500,000 copies issued yearly, the same number, 30,000 copies, is placed at the disposal of the Secretary. Fifty thousand copies, at least, are required for the needs of the Department.

SALE OF DEPARTMENT PUBLICATIONS.

Through the courtesy of the Superintendent of Documents of the Office of the Public Printer I am able to present a report of the sale of Government publications, which shows a very large and increasing demand for the publications of this Department, even when the same have to be paid for. This fact suggests the possible—I might almost say probable—solution of the great difficulty which now attends our efforts to achieve an effectual and equitable distribution of our publications. The following table shows the number of Government publications sold and the amounts received therefor during the past four years:

Number of publications sold and amount received.

Department.	Publications sold.				Amount received.			
	1901.	1900.	1899.	1898.	1901.	1900.	1899.	1898.
Department of Agriculture	24,127	16,905	18,750	17,740	$3,220.25	$2,157.65	$2,154.45	$2,089.15
All other Departments	9,458	10,928	8,058	3,623	6,862.44	6,744.56	5,401.66	2,448.12
Total	33,585	27,903	26,808	21,363	10,082.69	8,902.21	7,556.11	4,537.27

IMPROVEMENT OF ILLUSTRATIONS.

In the enforced economy in our publication work, owing to the limited funds at our disposal, the work of illustration has unduly suffered. It has been treated more as a nonessential in a publication, however desirable it might be. In connection with the work of this Department, illustrations, though not always essential, are in many cases, when properly conceived and executed, extremely useful. The rule laid down in this branch of the work is to exclude merely ornamental pictures, and to confine illustrations to such as are desirable and calculated to facilitate the reader's apprehension of the text. It is also of the first importance that such illustrations should be the best of their kind. It has not been possible for the last two years to fulfill either of these conditions, and I have deemed it desirable to include in the appropriations for next year a special sum sufficient to pay the necessary force of artists and draftsmen, and to provide for a certain amount of illustration work over and above what we can afford to include in the regular printing fund.

NEED OF ENLARGED QUARTERS.

The urgent need of a new building is nowhere more forcibly exemplified than in the objectionable conditions under which it is necessary to carry on the work of this Division. Crowded and inadequate quarters assigned to the Division here and there—some on the main floor and some in the attic of the main building, others in widely separated

and for the most part unsuitable buildings—grievously hamper the work of the 140 persons necessarily employed in the editing, illustration, and distributing of publications, and in the correspondence and clerical work entailed thereby.

SECTION OF FOREIGN MARKETS.

Agriculture contributed conspicuously to the remarkable expansion of American commerce witnessed during the past year. According to statistics prepared by the Section of Foreign Markets, the highest record previously attained in the exportation of agricultural products from the United States, that for 1898, was surpassed by more than $90,000,000 in the fiscal year ended June 30, 1901, when a value of over $950,000,000 was reached. Fully 65 per cent of the domestic merchandise sent abroad during the year originated on the farm.

EUROPEAN MARKETS.

Among our foreign customers in agricultural products the United Kingdom stands preeminent, taking over 50 per cent of our exports. Recent investigations by this Section into the possibility of still further increasing our trade in the British market brought out the significant fact that during the calendar year 1900 our agricultural exports to the United Kingdom, large as they were, comprised only 33 per cent of the foreign farm produce purchased by that country, leaving two-thirds of such produce to be supplied by our competitors.

In view of this fact, the desirability of procuring exact information as to the character of the agricultural imports received by the United Kingdom from countries other than the United States was apparent. The Section has accordingly begun the preparation of a comprehensive report on the subject. It will be the special object of this report to suggest such opportunities as exist for extending our trade in the British market in competition with other countries that are now conducting a lucrative business there.

After the United Kingdom the most important foreign markets for our surplus farm products are afforded by Germany, France, the Netherlands, and Belgium. During 1901, Germany received 15 per cent of our exports, and France, the Netherlands, and Belgium together about the same amount. Each of these countries like the United Kingdom is at present importing extensively from other sources. They therefore offer similar opportunities for more active competition on the part of the United States. Reports on the agricultural imports of these countries have also been planned.

TRADE WITH DEPENDENCIES.

Special statistics have been compiled by the Section relative to our trade in farm products with the new insular dependencies, except

Hawaii, for which no separate returns are now made. Our agricultural exports to Cuba, Porto Rico, and the Philippine Islands in 1901 were valued at $18,600,000, comprising about 53 per cent of the domestic merchandise sent to those destinations. Compared with the trade for 1900, amounting to $17,551,000, the returns for 1901 exhibit a slight increase, gains in the exports to Porto Rico and the Philippines more than counterbalancing a considerable decline in the exports to Cuba.

As regards our agricultural imports from the three dependencies under consideration—Cuba, Porto Rico, and the Philippines—there was a decided increase, the value for 1901 amounting to $48,600,000, as compared with only $36,162,000 for 1900. The bulk of the gain occurred in the imports from Cuba, but there was also a noticeable increase in the case of Porto Rico. The imports from the Philippines showed a decline.

TRADE OF PACIFIC PORTS.

During the year the Chief of the Section of Foreign Markets was detailed to accompany the Congressional Committee on Rivers and Harbors upon its tour of inspection to the ports and waterways of the Pacific coast. The trip afforded an excellent opportunity to study the growing export trade that is being conducted through our Pacific ports, and much valuable statistical information was gathered on the subject. Of the $70,000,000 worth of domestic merchandise exported from the Pacific coast during the fiscal year 1900, $45,000,000 worth, or considerably more than half, consisted of farm produce. Indications point to a still further increase during the immediate future, the opening of new markets in the Orient and the rapid development of the wonderful agricultural resources of the Pacific coast region combining to render this branch of our commerce one of the most promising.

LIBRARY.

ACCESSIONS TO THE LIBRARY.

During the past year the accessions to the Library have numbered over 4,000 books and pamphlets. These accessions included many reference books of especial value in the work of the Department and a large number of scientific periodicals. The latter class of publications, obtained by purchase and by exchange, forms the most considerable, as well as the most valuable, part of the annual accessions.

CATALOGUE.

In addition to the regular work on the general card catalogue, a "Catalogue of periodicals and other serial publications" contained in

the Department Library has been completed and will be issued at an early date. Two reference lists, one containing references to publications on irrigation and land drainage and the other on tobacco, have been prepared, but a lack of funds for printing delays their publication as Library bulletins. It is to be regretted that the printing appropriation has not been sufficient also to provide for an increased number of issues of the card index to the Department publications. This index has increased the usefulness of these documents many fold.

DEMANDS UPON THE LIBRARY.

The constantly broadening fields of investigation being entered upon by the Department increase greatly the demands upon the Library. These investigations depend largely upon the extent of the Library's resources and their availability. To further these conditions adequate appropriations are needed, both for books and for their care and preservation. The amount of reference work done in the Library has increased so much during the past year that an assistant for this special work is much needed.

ASSISTANCE TO AGRICULTURAL COLLEGES AND EXPERIMENT STATIONS.

In not a few cases college and station workers have drawn upon the resources of the Library to assist in some special work. Whenever it can be done without interference with the work of the Department, the usefulness of this large collection of books and pamphlets, many of which are not to be found elsewhere in this country, should be thus extended. This Library may justly claim to be the headquarters for agricultural literature, and as such should be able and ready to meet the demands from without as well as from within the Department. The requests which come from colleges and station libraries for suggestions as to the best arrangement of their material and as to other details of administration should be met with a ready response.

NEED OF MORE SUITABLE ACCOMMODATIONS.

The present Library room is entirely inadequate for the accommodation of readers and for the work of the Library staff. Much space is occupied for other than library purposes on account of the generally crowded condition of the Department offices. In addition to the necessity for more commodious accommodations for the present collection of over 70,000 books and pamphlets, there is the still greater need of a safer building than the one in which the Library now is. The destruction of any considerable part of this valuable collection of books would be an inestimable loss to the Department in particular and to scientists at large.

DIVISION OF ACCOUNTS AND DISBURSEMENTS.

Congress appropriated $3,303,500 for the United States Department of Agriculture for the fiscal year ended June 30, 1901, being an increase of $558,920 over the appropriation for the preceding year. When all accounts shall have been finally settled the payments will amount to about $3,220,000.

The regular appropriation of $15,000 for each of the 48 agricultural experiment stations in the several States was also made.

On June 30, 1901, the unexpended balances of the appropriations for the year 1899, amounting to $28,899.27, were covered into the Treasury.

During the year $6,340 was paid for rental of leased buildings in Washington. Owing to inadequate accommodations Congress, at its last session, provided for the lease of additional buildings, and the rental for the fiscal year 1902 will exceed $10,000.

BIOLOGICAL SURVEY.

The Biological Survey is engaged in mapping the boundaries of the natural crop belts of the country and aims to furnish the American farmer with lists of agricultural products which, so far as climatic conditions go, are likely to be a commercial success in different parts of the country. This work is based on the theory, the correctness of which is believed to have been established by the Biological Survey, that the boundaries set by nature to areas inhabited by particular kinds of native animals and plants are likewise the boundaries of areas in which particular agricultural crops may be most successfully cultivated.

LIFE ZONES AND CROP BELTS IN TEXAS AND CALIFORNIA.

During the past season the work of mapping the life zones and crop belts in the West has been continued, particularly in Texas and California. In Texas the boundaries of the several belts have been in the main determined, and it has been ascertained that over a large part of the arid lower Sonoran zone a fiber plant, a species of agave closely related to the Mexican istle or "Tampico hemp," grows in great abundance, covering an area about 20,000 square miles in extent. In view of the enormous quantity of fiber of other species of agave annually imported into the United States, mainly from Mexico, amounting in 1900 to 82,669 tons, worth $12,257,353, the Texas species is likely to prove of considerable commercial value.

In locating the boundaries of the zones in California many interesting facts have been brought to light. In this State, owing to the trend of the mountains and the influence of the coast fogs, the zones run in the

main north and south instead of east and west; and, except in the coast region and the northern part of the State, all but one are pushed up into the mountains. The valleys of the coast ranges, in retreating from the sea toward the interior, receive less and less fog and more and more heat and sunshine, affording in their individual climatic peculiarities conditions favorable for the growth of widely different agricultural and horticultural crops. Thus, while some are cool enough for apples, cherries, and the sugar beet, others are warm enough for almonds, citrus fruits, and raisin grapes. The hottest parts of the State, as well known, lie in the deserts east of the mountains, where, through the instrumentality of this Department, the date palm seems destined to become an important and profitable crop.

DESTRUCTION OF PRAIRIE DOGS.

On our great plains, which stretch from Montana and the Dakotas southward far into Texas, one of the chief enemies to agriculture and stock raising is a large ground squirrel known as the prairie dog. This animal appears to be increasing rapidly, owing to the destruction of its natural enemies, chiefly coyotes, badgers, ferrets, hawks, owls, and eagles. It is destructive not only to grain, alfalfa, and other cultivated crops, but also to the native bunch grass; and ranchmen complain that on certain grazing lands over which its colonies have spread during the past few years its mounds are so numerous and its consumption of herbage is so great that only half as many cattle can be pastured as formerly. In response to persistent complaints and urgent requests for remedies, the Biological Survey has prepared and distributed a circular of directions for the destruction of prairie dogs, and is now conducting field experiments in the Dakotas, Nebraska, Kansas, and Texas with a view to the discovery of remedial measures cheap enough for general use on the ranch lands of the plains.

SOME USEFUL AND NOXIOUS BIRDS.

In southern California it has been discovered that two species of birds, the Bullock oriole and the California least tit, feed extensively on the destructive olive scale, an insect injurious to both olive and orange trees, and that the common Western goldfinch feeds on green plant lice. On the other hand, some birds, particularly the house finch or "linnet," are bitterly complained of as enemies of the fruit grower. The relations of birds to fruit culture in California are so important that the assistant in charge of this subject was sent to the principal fruit-growing areas of the State, where important investigations were made, the results of which are now being prepared for publication.

In Texas it has been found that the large blackbirds, locally known

as "jackdaws," which have been slaughtered in great numbers for the millinery trade, are particularly valuable in the rice fields and cabbage growing districts, feeding extensively on the crayfish, which cut the rice, and on the destructive cabbage worm. In other investigations of the food habits of birds special attention has been given the thrushes, titmice, sparrows, orioles, woodpeckers, flycatchers, and swallows. The growing interest in economic ornithology is shown by the rapidly increasing demand for literature on this subject, to partly meet which a number of bulletins on food habits of birds have been published and distributed. The edition of one of these, entitled "Some common birds in relation to agriculture," has already reached 220,000 copies.

WORK UNDER THE LACEY ACT.

In addition to its other duties the Biological Survey is charged with general supervision of matters relating to game protection and introduction. It publishes bulletins on this subject and on laws governing the transportation and sale of game, digests of State game laws, and so on, and aids in every way possible the preservation of native birds and game. In carrying out the provisions of the Lacey Act the Department has received the active cooperation of three other Executive Departments—Treasury, Interior, and Justice; of several railroad and express companies; and of many State officials and individuals. A system of permits for the importation of foreign wild animals and birds has been successfully put into operation, and provision made for inspection at six of the most important ports of entry. During the year the number of permits issued was 186, covering the entry of about 350 mammals and nearly 10,000 birds. In order to avoid undue annoyance to importers I have extended the list of species which can be imported without permits to include a number of well-known animals intended for exhibition purposes. It is gratifying to state that the law has accomplished its main purpose in preventing the introduction of the mongoose and other injurious species, and has also brought to light several facts of interest. A considerable trade in live pheasants is carried on with Canada; thousands of Chinese quail are imported alive at San Francisco; and cage birds of many species are imported from Germany, China, Japan, Australia, and Mexico. The danger of introducing injurious species is very great, since several thousand birds are frequently imported in a single consignment; protection lies in careful inspection at the port of entry. During the coming year the inspection service will not only be improved but will be extended to Hawaii. Provision should be made for placing this service on a permanent basis and for maintaining it in the most efficient manner.

INTERSTATE COMMERCE IN GAME.

Numerous violations of the law regulating interstate commerce in game have been reported, and in many instances the Department has

been called upon to assist in prosecuting the offenders. Fifty-seven cases have been investigated, of which 27 have been referred for action to the Department of Justice, but whenever possible the evidence has been placed in the hands of State authorities. For the first time in the history of game protection it has been possible to secure convictions in cases involving illegal shipment of game months after the offenses were committed, and with evidence obtained a thousand miles or more from the point of shipment.

NEED OF MORE LIBERAL APPROPRIATION.

Again it seems necessary to call attention to the insufficient appropriation by reason of which the Biological Survey is obliged to carry on its field work in a piecemeal way, doing a little each season and returning the next year to the same region. The work could be done for considerably less money if the survey of a particular area could be completed at one time. A special effort has been made to carry the prairie dog investigation to a successful conclusion, but this requires field work on the Great Plains in the early spring, for which no funds are available. Owing to the same cause the Biological Survey has been forced to decline requests from several States for cooperation in carrying on local biological surveys. Such cooperative surveys would hasten the completion of the zone and crop maps, and would be of material service both to the States interested and to the General Government.

DIVISION OF STATISTICS.

With a smaller appropriation available for its work than was expended for a like purpose in any fiscal year from 1891 to 1898, inclusive, the Division of Statistics has endeavored to meet the ever-growing demand for statistics of the agricultural industry. It handled during the fiscal year nearly 2,500,000 returns from a corps of correspondents numbering about 250,000, the results of its work appearing in 18 separate reports, of which over 1,500,000 copies were printed.

While its work has consisted largely, as heretofore, of the preparation of reports relative to the principal products of the soil, including the extent and geographical distribution of the area of production, the condition and prospects of the crop during the growing season, and the quantity, quality, and disposition of the product harvested, it has also included reports on other branches of rural economics, such as the cost of transportation, the prices of agricultural products, the wages of farm labor, and the extent to which the principle of cooperation has been applied to different branches of the agricultural industry.

There is an urgent demand from many different directions for a substantial broadening of the scope of the work of this Division. Only the insufficiency of the appropriation prevents the live stock and live-stock products of the country—an interest so enormous that after sat-

isfying the needs of our own large population there was available last year for export over $250,000,000 worth of its products—from being reported upon as promptly and fully as are the cotton, corn, and wheat crops of the country. The annual fruit crop, the egg and poultry industry, beet sugar, flaxseed, and other products of great and growing importance also claim attention. The Department has already in operation all the agencies necessary to the collection, as often as may be necessary, of the required information relative to these important interests, and all that remains to be done is to provide the means for the employment of such additional experts and statistical compilers as may be necessary to the prompt compilation and analysis of so large an amount of additional statistical data.

Negotiations with the Governments of the principal grain-producing countries of Europe looking to a telegraphic interchange of crop reports are far advanced, and the growing season of 1902 will see the American farmer placed in as prompt possession of reliable statistics concerning the principal grain crops of foreign countries as he is of those of the United States.

For several years past determined efforts have been made, with the cooperation of the Public Printer, to expedite the publication and distribution of the Statistician's crop reports, so that as little time as possible might intervene between the issue of the telegraphic summary, the circulation of which is necessarily chiefly commercial, and the receipt in the most remote agricultural county of the complete report. On May 31, 1901, however, at a time when the keenest interest was prevailing throughout the entire South as to the extent of the newly planted acreage of cotton, a card containing the most important points of the Statistician's report on the subject was mailed to 24,000 Southern post offices within three hours of the publication of the telegraphic summary, with a request that postmasters would give it prominent display in their offices. This was done largely as an experiment, and so successful was it that within a few weeks its operation was extended with the most gratifying results to the grain reports. A farmer has now only to visit the nearest post-office to see the Statistician's latest report on the principal crops, and the measures adopted by the Public Printer and Postmaster-General have reduced to a minimum the time necessary to placing this important information within the farmer's immediate reach.

The remarkable accuracy of the Statistician's advance estimates of the cotton crop in each of the last two years has excited much favorable comment both in the United States and abroad, and his work in general is commended to Congress as worthy of largely increased provision for its further extension and improvement. This Division is growing in usefulness and in the estimation of the people. It is outgrowing its present environment and it will be wise in the near future to give it bureau enlargement.

SALARIES INADEQUATE.

During the remarkable developments in the agriculture and commerce of this country within the past fifteen or twenty years, the Department of Agriculture has steadily improved its personnel, has broadened its work along economic lines, and has contributed not a little to the progress of events and to the building up of domestic and foreign trade. Originally organized as a scientific bureau for acquiring and disseminating among the people useful information, it has solved many problems in animal industry concerning the cause and remedy of disease, has stamped out contagious diseases which threatened to ravage the country, and has kept open foreign markets by its system of rigid and competent inspection; through the Weather Bureau it has aided in saving growing crops and the products of the farm in transit, besides being of inestimable value in its warnings for the benefit of commerce in lake and ocean navigation. It has investigated the proper methods of controlling plant diseases and insect pests. It has studied and classified soils, pointing out their necessities and their values for certain crops, and has introduced new crops and new industries from abroad.

The Department has endeavored to retain the best scientific talent in the country for the investigation of the many problems confronting the agriculturist, in the interest not of pure science but of agricultural and commercial development. Coincident with the growth in the Department's duties, and largely as an outcome of it, numerous institutions have grown up in every State of this country, as well as in foreign lands, devoted to lines of work similar to those pursued in the Department, which may be generally described as the application of science to the service of agriculture. These State and governmental institutions, and the private agricultural interests as well, are now paying salaries for expert services commensurate with those paid in professional and industrial lines. Men with good business training and thorough understanding of agriculture and a fair knowledge of scientific principles and methods are constantly in demand at good prices.

There has never been in the history of the world such a strenuous competition between the different countries for commercial supremacy as exists to-day. Each nation is exerting itself to the utmost to extend its production, so as to supply its own wants and to provide a surplus for exportation. In doing this they are depending more and more upon the aid of science, and are taking advantage of every scientific discovery. The result is that men who combine knowledge with experience and practical ability are difficult to get and are increasingly in demand. In the general conflict between nations it is obvious that that country which has been the most liberal in securing properly equipped organizers of its industry is sure to have the advantage in this commercial strife.

Yet the Department of Agriculture of this country has frequently had to record the loss of men trained in its services, who have been called away to other fields by offers of more generous remuneration. The danger of losing good men has never been so great as at the present time. Last year a foreign government secured one of our tobacco experts at a salary four times what this Department was giving him, and quite recently the papers have announced that the result of investigations made under his auspices are so promising that it is believed the demand for American and other imported tobaccos in that market can be stopped and the requirements supplied by home production. Subsequently an offer was made to another tobacco expert in the employ of this Department at a salary of about three times what he was being paid. This had to be met by an increase in his salary, amounting to one-third more than the chief of the division who was directing the work was allowed by statutory enactment. As an executive act, this was not good policy nor compatible with the best interests of the Department, but the work in hand had to be provided for, pending further action by Congress.

More recently still, advances have been made by several foreign governments to secure the services of some of the leading men of the Department, the chiefs of Bureaus, offering such liberal increases over the salaries paid here that it becomes almost a matter of duty on the part of the men to accept. Such acceptances, if carried out, would not only cost the Department some of its leading men, but would also draw away many of their subordinates who are now in excellent training for valuable work.

It is apparent in reviewing the work of the past fiscal year that the men who have planned and executed the investigations which have been carried on, have earned for the country many times over the cost of their salaries and the money appropriated for their use. It is an axiom among business men that the more expensive employees are often the cheapest, by reason of their being most productive. The Department has always been obliged to train its own men, and has only too frequently lost their services when, from their ability to handle large questions, they have been called elsewhere at more remunerative salaries. The Department should not always be in this position of having to train its men in order to get them cheaply, but should be allowed to secure the services of capable men already trained by giving salaries commensurate with the valuable commercial interests to be put in their charge. The loss of time necessary to train men to handle these problems is in itself a serious drawback, and if they are called elsewhere after receiving their training and before they give valuable returns to the Department in the way of productive work, the time and money spent upon their training is largely thrown away.

In view of these facts, I have provided in my estimates for a salary

of $5,000 for the chiefs of the Bureaus in this Department, firmly believing that the men who now occupy these positions are fully deserving of such salaries; that if less is given them they will be called to other countries or to other positions in this country, and that if these men, who have been instrumental in the remarkable development in the work of the Department in recent years, sever their connection with the institution it will be impossible to fill their positions with capable men for anything less than the salaries named. I would urge upon Congress in the strongest terms liberality in this regard, as I believe it to be for the best interests of the country to obtain and retain the best men that can be found for these important positions; and I would also urge this increase in their salaries in order that we may appoint experts at salaries which they can command in commercial lines, and not have to take the humiliating step of paying the experts more than the chief of the bureau who is directing the work, a step which has had to be taken twice already in one of the Bureaus of this Department, in order to secure from the commercial world men competent to maintain the integrity and insure the success of the work that had been undertaken.

The chiefs must direct the special technical education of the students in their lines. If we could look to the universities and colleges of the country for men prepared to do our work in applied sciences relating to agriculture, the loss of an expert chief would not be so serious. From the agricultural colleges we are getting young men and women as scientific aids, who will become valuable investigators and teachers in their specialties after being trained in the Department, but the chiefs who train them are indispensable at present.

Respectfully submitted,

JAMES WILSON,
Secretary.

WASHINGTON, D. C., *November 23, 1901.*

DEPARTMENTAL REPORTS.

REPORT OF THE CHIEF OF THE WEATHER BUREAU.

U. S. DEPARTMENT OF AGRICULTURE,
WEATHER BUREAU,
Washington, D. C., July 22, 1901.

SIR: I have the honor to submit a report of the operations of the Weather Bureau during the fiscal year that ended June 30, 1901.

Respectfully,

WILLIS L. MOORE,
Chief of Weather Bureau.

Hon. JAMES WILSON, *Secretary.*

WORK OF THE YEAR.

OCEAN FORECASTS AND INTERNATIONAL COOPERATION.

An important extension of the forecast work of the Bureau was made during the year. By an arrangement with the secretary of the meteorological office at London, England, the transmission by cable from London to Washington of meteorological reports from certain points in the British Isles and on the Continent of Europe, and from Ponta Delgada, Azores, was begun December 18, 1900. These reports, with observations from Nassau, Bermuda, and Turks Island, have been regularly published on the daily weather maps issued at Washington, Baltimore, Philadelphia, New York, and Boston, together with forecasts of the force and direction of the wind and the state of the weather for the first three days out of steamers bound east from American ports.

The Atlantic forecasts, which are based on the American, Atlantic, and European telegraphic reports, were begun January 7, 1901, and on June 1, 1901, they were made a part of the regular general night forecasts issued at Washington. In a number of instances, when storms of marked strength were passing eastward off the American coast, forecasts were issued of the character of the weather which would probably be experienced by steamers leaving European ports westward bound, and by an arrangement with Lloyd's, of London, these advices have been cabled to England.

In addition to the daily forecasts of wind and weather and special storm warnings, predictions of fog were issued when conditions favorable for fog development had been indicated in the steamer tracks west of the fiftieth meridian. Reports from trans-Atlantic steamships show that these forecasts and special warnings have been well verified.

In November, 1900, arrangements were made with Portugal to receive reports from the meteorological observatory at Horta, in the Azores. Observations are now regularly received by cable from that

place, and they are of much value in the work of forecasting the movements of storms on the Atlantic Ocean.

NEW FORECAST DISTRICTS.

Three additional forecasting districts have been established and designated as the New England district, the West Gulf district, and the Rocky Mountain district, with headquarters at Boston, New Orleans, and Denver, respectively. The last appropriation bill passed by Congress made provision for three additional forecast officials to be placed in charge of these districts with authority to issue forecasts and warnings for the several States that are comprised in each district. This system has the advantage of enabling each forecaster to devote more time to the consideration of the predictions for each district and of securing an earlier distribution of forecasts. As these forecast officials were selected on account of their ability as forecasters for their respective sections, it is expected that an improved service will result.

IMPROVEMENT IN FORECASTS.

Special consideration has been given to the subject of increasing the accuracy of the forecasts of the Weather Bureau to the highest degree attainable, and, as a means of stimulating among the employees of the Bureau the study of the problems of weather forecasting, announcement has been made that hereafter marked success in forecasting, the invention of new methods of forecasting, or the discovery of new facts or principles of marked value to the forecaster, will have a special weight when the merits of employees of whatever grade for promotion are considered.

The forecasters of the central office at Washington have been relieved, as far as possible, of all other routine work, and they will devote their whole time and energies to forecast duty. These forecasters, when not detailed at the daily work of forecasting, will engage in studies that aid them in their work. It is believed that this arrangement will result in an improvement of the forecasting work of the service.

CLIMATE AND CROP WORK.

The lines of work pursued in previous years by the climate and crop service of the Weather Bureau were continued, and extensions and improvements made wherever possible. The cotton-region service has been extended into Oklahoma and the Indian Territory, and arrangements have been made for inaugurating a similar work in California, to be known as the fruit and wheat service.

Few persons realize what a complete system the Weather Bureau forms for the accurate and rapid collection and dissemination of crop information. It has 1,200 paid and skillfully trained officials outside of Washington, who are quite evenly distributed over the United States and its island possessions, and who are available to report on any matters concerning weather, crops, climate, or statistics. It has 200 officials and employees at the central office in Washington. It has 180 fully equipped meteorological stations quite equidistantly scattered over the United States and its dependencies, each manned by from one to ten trained officials, which stations are not only weather observatories, but are centers for the gathering of statistical and climate and crop reports. It has a central observatory in each State and Territory,

to which all subordinate offices in the State report, and to which all voluntary weather and crop observers report. These central observatories are equipped with printers, printing plants, trained meteorologists and crop writers, clerks, and messengers.

The State central offices are under the systematic direction of the central office at Washington. The central office at Washington is equipped with cartographers, printers, pressmen, lithographers, and elaborate addressing and mailing appliances for the printing and mailing of large quantities of national weekly, monthly, quarterly, or annual reports and bulletins. The telegraph circuits of the Weather Bureau are ingeniously devised for the rapid collection, twice daily, of meteorological reports; they are also used to collect the weekly National crop bulletin. The Bureau has 315 paid temperature and rainfall reporters who are now daily telegraphing their data from the growing fields to certain cotton, corn, and wheat centers. It has 250 storm-warning displaymen distributed among the ports along the Atlantic, Gulf, and Pacific coasts and in the lake region. It has an observer serving each morning on the floor of each important board of trade, commercial association, or cotton or maritime exchange in the country, who displays weather and crop information, and each day charts the weather reports on a large map. It has 3,000 voluntary observers—nearly one for each county in the United States—equipped with standard thermometers, instrument shelters, and rain gauges, who have for years intelligently served the Government by taking daily weather observations and rendering weekly crop reports to State central offices. There are 14,000 persons reporting weekly to the climate and crop centers as to the effect of weather upon the crops in their respective localities. These voluntary crop correspondents could quickly be increased in number to several hundred thousand if occasion required. In four weeks there are printed and distributed 168 different State crop bulletins, four National crop bulletins, and 42 monthly eight-page State climate and crop bulletins. The weekly State crop bulletins are written by the directors of the different State sections, and the weekly National crop bulletin by Mr. James Berry, chief of the climate and crop division of the Weather Bureau, a man who has had many years experience as a writer on crop conditions in the United States.

FORECASTS BY RURAL FREE DELIVERY.

Particular attention has been given to the distribution of forecasts by means of the rural free delivery. There are now in operation 365 centers supplying an aggregate of nearly 42,000 families in the farming districts with the latest weather predictions. This work has become decidedly popular, and we have had the hearty cooperation of the Post-Office Department in making it a success.

Estimate has been made for additional appropriation with which to extend the distribution of forecasts and warnings by this method. The rural free delivery places the frost and cold-wave warnings in the hands of those who can make the most valuable use of them. It is expected that the Bureau will reach several hundred thousand farmhouses with the daily forecast before the expiration of the coming year.

MOUNTAIN SNOW BULLETINS.

The local snow bulletins that are issued by the State centers in the Rocky Mountain region are meeting a very important need. These

bulletins give complete information as to the depth and character of snowfall in the mountains—data that have such an important bearing on summer water supply for irrigation purposes.

ETHERIC SPACE TELEGRAPHY.

Substantial improvements have been made during the past year in the Weather Bureau system of wireless telegraphy. The line of research has been divided into three classes: First, the perfection of a more powerful transmitter, in which the energy of radiation shall be greatly increased; second, the devising of a more delicate receiver, one that would be positive instead of depending upon an imperfect and variable contact, as do all systems now in use; and, third, the perfection of a system of selective telegraphy whereby messages can be differentiated and only the receiver that it is desired shall receive the message become responsive to the waves of ether.

The first of these problems may be said to have been successfully solved, and a transmitter devised capable of radiating all the energy generated; the second is believed to be nearing a successful solution; the third is thought to be well demonstrated theoretically, but has not been fully tested in practice.

While there is much experimental work yet to be done before our system, or any system of which I have knowledge, is reliable for intership communication, or before any two systems can work within the same field without each rendering the other useless, such progress has been made by the Government experimenters that, with no interference by private systems, stations can be successfully operated over at least 150 miles of coast line, and they are now in operation on the North Carolina and Virginia coasts, and soon will be instituted between the Farallone Islands and the mainland, and Tatoosh Island and the mainland, on the Pacific coast.

If a system of selective telegraphy can not be perfected so that one system does not interfere with and render useless another, and thereby prevent all use to commerce of recent discoveries in wireless telegraphy, it may become necessary, on account of the value of these discoveries to our marine interests, for the Government to take exclusive control of all systems of etheric space telegraphy and to establish stations along our extensive coast lines at such distances and in such relation, the one to the other, that they shall not interfere. Even then there will occasionally be difficulty in communicating with the mainland whenever two ships in close proximity are attempting to transmit or receive messages at the same time.

DESTRUCTION OF HAILSTORMS WITH CANNON.

Considerable interest has been aroused among agriculturists in the United States relative to the prevention of hailstorms by the use of explosives fired from specially designed cannon. The experiments conducted along this line by grape growers of France and Italy have aroused popular interest in this country. The theory is not a new one, though perhaps not so ancient as the idea that precipitation occurs soon after and as a result of the explosives used in battles. As early as 1769 the Marquis de Cheviers, a retired naval officer of France, thought that he could combat the scourge of hailstorms by the firing of cannon, but his experiments, like those conducted by many others at various times during the past century, were not productive of definite results.

One of the most serious drawbacks to grape culture in Europe is the destruction caused by hail, and the growers are naturally interested in anything that promises to give immunity from such damage. During the past two or three years renewed interest has been taken in the matter by the vineyardists of certain parts of France and Italy. Several manufacturers have placed upon the market a special form of cannon which they claim will effectively break up hail-bearing clouds. The belief in the efficacy of this method of protection has become quite general in Europe, although scientists versed in the physics of the air have not expressed confidence in the system.

In brief the apparatus in use consists of a cannon fitted with a funnel-shaped conical extension. The difference between the various forms of cannon that are used lies mainly in the shape and size of the funnel extensions and the size of the powder charges. Usually the cannon are fired vertically upward, although in some instances the apparatus is inclined toward an advancing cloud. The effect of the funnel attachment is to cause the formation of a mass of rapidly revolving air, or vortex, which leaves the mouth of the cannon with tremendous velocity. In shape, these vortices can be likened somewhat to the rings or puffs of smoke made by a person smoking a cigar. It is claimed that these whirling masses of air, intermixed with gases from the explosives, are forced upward to a sufficient height to enter the hail cloud and destroy its hail-forming processes. If it is granted that these rings ascend to a sufficient height to enter the cloud, I am of the opinion that the force of the ring is too puny to have any appreciable effect on the cloud.

Many experiments have been made for the purpose of ascertaining the actual height to which these air rings rise before being dissipated. In a report by Profs. J. M. Pernter and W. Trabert, who, at the invitation of the Imperial Department of Agriculture of Austria and of the inventor of one of the methods, made as complete an investigation as was possible, and under various conditions, these scientists stated that they were not able to report anything positive as to the value of hail shooting. They reported that, using the largest cannon and the heaviest charges, the vortices did not ascend to a height of 1,000 feet on an average, although in some instances greater distances were obtained.

There is a marked difference of opinion as to the effectiveness of cannon firing, with the manufacturers and many grape growers on the one side and the scientists of America and Europe on the other. The former maintain that hailstorms can be prevented in the manner described, while the latter claim that the force exerted by the explosives is infinitesimal as compared to the forces of nature that are exerted in hail formation, and that experiments conducted by the adherents of the cannonading process themselves have not produced convincing results. The number of thunderstorms from which hail is precipitated is but a small percentage of the actual number. In most localities of the United States a whole season sometimes passes without a fall of hail, while in seasons of abnormal thunderstorm frequency the number of hailstorms is small. While in the grape-growing regions of France and Italy there may be greater hailstorm frequency, it is still true that the number of hailstorms are few as compared to the number of thunderstorms without hail. The experimenters score a success whenever they shoot at a thunderstorm cloud that does not produce hail, although the chances are greatly in favor of there being no hail in the cloud. Again, they excuse the occurrences of hail in

spite of a bombardment by saying that the cannon was not large enough or the powder charge sufficiently heavy, and declare that the hailstorm was far less severe than it would otherwise have been. How is one either to prove or disprove such statements?

It is true that many important discoveries have been made by experiments that were conducted contrary to scientific theories, and in the matter under discussion it is not our intention to overweight the scientist or to underestimate the practical investigator, but unquestioned facts and not explanations must be the proof of results. Scientists both in America and in Europe declare that hailstorms can not be prevented by the use of cannon and explosives of even greater power than have been used or that it is possible for man to use, and they base their belief on such knowledge of the forces of nature as science has revealed. Those opposed attempt to break down the scientists' argument by declaring that no one has yet satisfactorily explained the processes of hail formation. This is true to a certain extent, but enough is known upon which to base a logical opinion.

But there are other reasons for believing that the use of cannon and explosives in preventing hailstorms is not effective. Mr. Stiger, one of the inventors of the apparatus in use, claims that hail is formed in quiet spots in the atmosphere, where atmospheric moisture crystallizes out in large crystals in a manner analogous to the formation of large crystals of salt in liquid solution. I agree with Professor Abbe that there are no such quiet spots in the atmosphere, and hailstones are not crystals, but masses of ice with only a partial crystalline structure. Even the perfect crystals of the snowflake are formed in the midst of rapidly moving air. Hailstorms are generally local and very erratic. Some have maintained that they are controlled by the hills or the contour of the ground or by the presence of forests and lakes, and this may be true to a certain degree; but, practically, the whole question is one of ascending and descending currents that characterize whirlwinds and thunderstorms.

Several thousand shooting stations have been established in Italy and France during the past two years, but reports received from them give no definite data in support of the success of the experiments, although there is no doubt that the cannonading is believed to be effectual by the farmers who do the work. Waves of irrational enthusiasm sometimes sweep over a community, only to be regretted in subsequent years when calmer judgment has come to prevail. We have but to remember the experience of our own country only a few years ago with the rain makers, and how firm was the belief of thousands of people in the subarid and arid regions of the West that the use of powerful explosives would produce rainfall.

Thousands of dollars were expended in these experiments before the absurdity of the claim was demonstrated. It is a fact worthy of remark that the hail shooters are now using practically the same methods to dissipate the clouds that the rain makers used to produce them. Time and experiment will probably demonstrate that hail prevention by such means is as impracticable as rain production. The fact that 15,000 or 20,000 shooting stations have been established is of itself no argument as to the efficiency of the process. One might as well argue that the moon really affects the weather because a million people believe it and can prove it—to their own satisfaction.

A knowledge of the exact truth on any question of natural science

is not easily attained. The hail cannonaders base their reports of success upon such statements as "a black cloud was seen approaching, cannon were fired, and the cloud passed over without hail," or "it passed to one side and the hail did not fall on the protected vineyard, and there the hail ceased," or "the cloud broke in two, passing to the right and left, leaving the sky cloudless over the cannon." Now these are quite common cloud and storm phenomena, and they will frequently happen without cannonading. There is no way of telling by the sight of an approaching cloud whether or not it is accompanied by hail. Therefore, if the cannon be used every thunderstorm would have to be bombarded, although statistics have demonstrated that only one thunder cloud out of a great number contains hail. In other words, there would be a tremendous waste of time, money, and energy in unnecessary bombardments.

After examining all that has been published during the past two years on the subject of hail prevention, I have to repeat the opinion heretofore expressed that we have here to deal with a popular delusion, and that efforts should be made to prevent its spread in this country. The great processes going on in the atmosphere are conducted on too large a scale for any man or any nation to attempt to control them. According to Professor Abbe, the energy expended by nature in the production of a hailstorm, a tornado, or a rainstorm probably exceeds the combined energy of all the steam engines and explosives in the world. It is useless for man to attempt to combat nature on this scale.

THE MERIT SYSTEM AND THE DISCIPLINE IN THE WEATHER BUREAU.

A system of merit and discipline has been gradually developed in the Bureau, which not only conforms to the letter of the Civil-Service law, but carries its spirit to a logical conclusion. The system compels each employee or official to work out his own official salvation. It is fair to all; it enables honest and efficient persons to work themselves upward; it contributes to a high standand of manly character and to efficiency in public office, and it holds back those of mediocre attainments or of slothful habits.

The duties of the Bureau are exacting. It requires a strict discipline to administer a service with such extensive ramifications, and to have every man at his post of duty at exactly the same moment of time. To do this several times each twenty-four hours, as is necessary in the gathering and the charting of simultaneous weather observations, and in the rapid dissemination back to the country of the forecasts and warnings based upon the observations, the observers must be tractable, prompt to respond to orders, which often come by telegraph, and possessed of more than the average of education and intelligence.

The Secretary of Agriculture has given his unqualified approval to existing plans for the gradual intellectual growth and development of the clerks, observers, and other officials of the Weather Bureau.

It has been the purpose of the chief of the Bureau to recognize only the needs of the Weather Bureau and the merits of its employees in all matters of promotion, reduction, removal, or appointment, and to make only such recommendations to the Secretary as would meet his demands for an efficient service and inspire confidence among the workers of the Bureau in the fairness of the recommendations of the chief. The Secretary has been liberal in recognizing the meritorious workers of the Bureau; he expects a high standard of fitness in return.

Even before the Executive order requiring that a classified employee be given opportunity to answer charges before removal, no employee of the Weather Bureau was removed without a full investigation of his offense, and in no case was removal made of a person properly performing his duties. No person shown to be incompetent or unfit for the public service has been retained in the Bureau; and, except in one case where removal was made without the knowledge that the employee had not been given the opportunity to retrieve himself that the chief had directed, no person removed for either inefficiency or bad conduct has been reinstated.

It should not be supposed that promotion can be gained simply by passing the educational test. On the contrary, an employee must (1) make a good record for aptitude, efficiency, industry, and manly character, and (2) pass the educational test considered necessary to qualify him for the duties of the next higher grade.

Efficiency is determined from the observation of the work of the employee by his immediate official superiors and by the general appearance and the accuracy of such of the employee's work as may come under review at the central office in Washington.

Character is determined by the personal opinion of the employee's official superiors with regard to his general behavior as an officer, his social affiliations, his neatness of dress, his integrity of character, and his observances of the courtesies of business life.

Educational qualifications are determined by examination in the following subjects: English grammar, practical arithmetic, algebra (through quadratics or equations of the second degree), plane elementary trigonometry, elementary physics, popular astronomy, elementary plant physiology, and meteorology.

The educational qualifications for promotion are apportioned as follows:

For promotion to grade of $1,000 or more per annum—English grammar, practical arithmetic, and elementary meteorology.

For promotion to grade of $1,200 or more per annum—Elements of algebra through quadratics, elements of plane trigonometry, and elementary physics.

For promotion to grade of $1,400 or more per annum—Popular astronomy, elementary plant physiology, and meteorology.

A proficiency of 70, on a scale of 100 as perfect, is required to pass each of the subjects.

The foregoing examinations are not obligatory and failure to take them will not of itself be made the cause of reduction. Failure to take these examinations, and thereby to become qualified for promotion, will be construed simply as an evidence of satisfaction with the grade held at the time and a tacit indication of no desire for advancement.

In order that a high standard of official integrity and manly character may obtain throughout the various branches of the Weather Bureau, it is required that a firm yet kind discipline be maintained by all officials in charge of stations. For the preservation of the peace of their offices and the efficiency of the public service, they are enjoined not to permit one subordinate secretly to impeach the integrity of another, or to carry tales about his companions. Every complaint must be stated either in the presence of the one against whom it is directed, or else in writing and be referred to him for answer, so that no unjust impression may find lodgment in the mind of a supervising officer.

The new appointee is selected from a list of eligibles certified by the United States Civil Service Commission. He can not be certified until he has passed an examination by the Commission in spelling, arithmetic, penmanship, copying from rough draft, meteorology, English composition, geography, and algebra; nor if he be under 18 or over 30 years of age. The applicant is appointed for a probationary period of six months. In each case the appointee is informed in writing, and required to acknowledge the receipt of the communication, to the effect that the policy of the Bureau, under the direction of the Department, is to recommend for absolute appointment only those persons who show complete fitness for the work of the Bureau, and he is especially cautioned that no consideration except his own worth and value to the service will have any weight whatever in determining the matter of his retention.

Experience has demonstrated the wisdom of thus impressing upon a young man's mind the idea that, beginning with the very first day of his connection with the Bureau, he stands upon his own merit. It induces him to take up his work with a purpose and determination to earn, and therefore attain, permanency of position, with results generally gratifying to him and beneficial to the public service.

Once a month throughout the probationary period the official under whose immediate supervision the employee is placed renders a report on the conduct, service, and progress of the probationer, and this official is held strictly responsible that the reports be full and impartial. If after the trial period it is clearly shown that the appointee is morally, mentally, and physically qualified, permanent appointment is made. While the rules laid down for the guidance of probationers are exacting, yet it is required that they be applied with the utmost fairness, and when early reports indicate that the prescribed standard has not been maintained, admonition is sent at once to the employee when time remains for improvement; but undesirable employees are not retained after the expiration of six months, even on the ground sometimes put forth that they may qualify if given more time to develop.

The efficiency of the service can only be maintained by a rigid system of selection, and only those fully fitted to meet the exacting requirements of the Weather Bureau receive recommendation for permanent appointment.

As an illustration of the results that may be expected to follow after a just system of promotion has been inaugurated in a Government bureau, and adhered to for several years, I point to the fact that although it was known to every person in the Weather Bureau that Congress had made provision in the present appropriation bill for an additional professor, at $3,000 per year, and for two forecast officials, at $2,000 each, several months before the actual appointments were made, not a single employee made application for or exerted influence to secure one of these desirable places or any of the many promotions that resulted from these appointments. I am confident that the employees of this service realized that the persons best fitted for these important offices would be selected and that personal application was unnecessary.

Such a discipline has proved its beneficence during six years of practice. It has the hearty good will of the employees of the Bureau, and the Secretary of Agriculture and the appropriations committees in Congress have sustained the chief of Bureau in its enforcement.

STORM-WARNING TOWERS.

Sixty of the new storm-warning towers referred to in my last annual report were installed during the past year, and each equipped with improved lanterns. In the majority of cases electricity is used as the illuminant. As a result of these improvements the distribution of storm warnings to shipping interests along the seacoasts and on the Great Lakes has been made much more effective. The work of placing these towers and lanterns at all the storm-warning display stations of the service will be prosecuted as fast as available funds will permit, and it is expected that 60 additional stations will be equipped by January 1, 1902.

WEATHER STUDIES IN SCHOOLS.

The increasing attention given to the subject of meteorology in schools and colleges throughout the country has resulted in large demands upon the officials of the Weather Bureau for lectures and other forms of instruction on this subject. Officials of this service have cooperated with educational institutions in this work as far as their official duties would permit.

BAROMETRIC REDUCTIONS.

The revision of the barometric system for the United States, Canada, and the West Indies is practically complete, and the results will soon be published. This work was conducted by Prof. F. H. Bigelow, and included a reexamination of the various elevations, the local and instrumental errors, the reduction of the station pressures to a homogeneous system, and the preparation of normal tables and charts of pressure, temperature, and vapor pressure at sea level, and at the 3,500-foot and 10,000-foot planes.

THE GALVESTON HURRICANE.

The principal storm of the year was the West Indian hurricane which devastated Galveston, Tex., September 8, 1900. This storm has been described in detail in the Monthly Weather Review and other publications, and it is classed as one of the most destructive storms on record. Upward of 6,000 human lives were lost and property to the estimated value of $30,000,000 was destroyed. The following is an extract from the report of Dr. Isaac M. Cline, who was in charge of the Weather Bureau office at Galveston at that time:

The hurricane which visited Galveston Island on Saturday, September 8, 1900, was no doubt one of the most important meteorological events in the world's history. The ruin which it wrought beggars description. Conservative estimates place the loss of life at the appalling figure of 6,000.

The barometer commenced falling during the afternoon of the 6th and continued falling steadily but slowly up to noon of the 8th, when it read 29.42 inches. From noon of the 8th it fell rapidly until 8.30 p. m., when it registered 28.48 inches, a fall of pressure of about 1 inch in eight and one-half hours. At about 8.30 p. m. the barometer rose at the same rapid rate that had characterized its fall.

Storm warnings were timely, and they received a wide distribution not only in Galveston but throughout the coast region. Warning messages were received from the central office at Washington on September 4, 5, 6, 7, and 8. The high tide on the morning of the 8th, with storm signals flying, made it necessary to keep one man constantly at the telephone giving out information. Hundreds of people who could not reach us by telephone came to the Weather Bureau office seeking advice. I went down on Strand street, and advised some wholesale commission merchants who had perishable goods on their floors to place them 3 feet above the floor. One gentleman has informed me that he carried out my instructions, but that the wind blew his goods down. The public was warned over the telephone and verbally that the wind would go by the east to the south, and that the worst was yet to come. People were advised to seek secure places for the

night. As a result thousands of people who lived near the beach or in small houses moved their families into the center of the city and were thus saved. Those who lived in large strong buildings a few blocks from the beach thought that they could weather the wind and tide, one of whom is the writer of this report. Soon after 3 p. m. of the 8th conditions became so threatening that it was deemed essential that a special report should be sent at once to Washington. Mr. J. L. Cline, of this office, took the instrumental readings while I drove first to the bay and then to the Gulf, and finding that half the streets of the city were under water, I added the following to the special observation at 3.30 p. m: "Gulf rising; water covers streets of about half of city."

The water rose at a steady rate from 3 p. m. until about 7.30 p. m., when there was a sudden rise of about 4 feet in as many seconds. At this time I was standing in the door of my residence, Rosenburg avenue and Q street. The water was about 8 inches deep in the building, and the sudden rise of 4 feet brought it above my waist before I could change my position. The ground at this point has an elevation of 5.2 feet, which made the tide 15.2 feet. The tide rose during the next hour nearly 5 feet additional, making a total tide in that locality of about 20 feet. The tide on the bay or north side of the city did not attain a height of more than 15 feet.

The prevailing wind was from the northeast until 8 p. m., when it shifted to the east and continued from this direction until 10 p. m. After 10 p. m. the wind was from the southeast and after 11 p. m. the prevailing direction was from the south or southwest. A storm velocity was not attained until about 1 p. m., after which the wind increased steadily and reached a hurricane velocity about 5 p. m. The greatest velocity for five minutes was 84 miles per hour at 6.15 p. m., with 2 miles at the rate of 100 miles per hour. The anemometer blew away at this time, and it is estimated that prior to 8 p. m. the wind attained a velocity of at least 120 miles per hour.

In commenting on the work of the Weather Bureau in issuing warning of the hurricane, the Boston Herald, of September 17, 1900, said:

The excellent service rendered by the Weather Bureau during the recent storms, which carried havoc in their path, is deserving of recognition. It was not through any lack of attention on the part of the forecasters that the victims of the hurricane on the Texas coast were overtaken by such a terrible disaster. The weather office sent out its hurricane warnings both for the Atlantic and Gulf coasts, and when the storm turned from the north of Cuba westward the Bureau turned its attention to Texas, and on the morning of the 7th, nearly thirty-six hours before the disaster, warned the people of Galveston of its coming, and during that day extended its warning all along the Texas coast, thus preventing vessels from leaving. Furthermore, the weather officials were remarkably successful in anticipating the coming of the hurricane, with less force, up toward the lakes, and thence in this direction. That such horrible disasters followed in the storm's path must be taken as showing either that the warnings were unheeded or that the havoc wrought was something inevitable.

The Chicago Inter-Ocean of September 14, 1900, said:

Simple justice demands public recognition of the efficiency of the chief of the Meteorological Bureau and his staff. They have demonstrated their usefulness in such manner as to set at rest all doubt with regard to the wisdom the Government has displayed in maintaining the weather service against all opposition and all ignorant prejudices.

After the vortex of the storm had passed Galveston it moved northward with a rapid loss of energy to Iowa, where it recurved eastward over the Great Lakes, attended by gales of unusual violence. Along this part of the storm's track ample warnings had also been sent, and a general observance of the warnings by the shipping interests reduced to a minimum the damage it caused in the lake region. On the morning of the 12th, when the storm was central in the St. Lawrence Valley, the following special bulletin was issued:

There is little doubt that severe and dangerous gales will be encountered to-night and to-morrow over the banks of Newfoundland and along the west part of the trans-Atlantic steamship routes.

Reports of incoming vessels showed that unusually severe and especially destructive gales prevailed over and near the Grand Banks during the period specified.

The following editorial from the Marine Record, Cleveland, Ohio, of September 13, 1900, indicates the value of the warnings to the shipping interests on the Great Lakes:

The Weather Bureau, also the officers in charge of lake stations, gave full and ample warnings of Tuesday night's gale, which swept over the lakes with such sad results to life and property. There can be no doubt but that this one warning alone has repaid the country for the outlay of the entire annual appropriation granted by Congress for the maintenance of the service. Too much credit can not be given to the chief of the Weather Bureau and the officers in charge of lake stations for the energetic and well-advised measures taken to warn vessels of the approach of the late gale and its probable severity.

FROST WARNINGS.

From September 15 to 18, 1900, a cool wave, which produced the first frost of the season, extended from the Northwestern States over the lake region, and frost occurred in the Northeastern States from September 25 to 27. Warnings of these frosts were distributed over the districts visited. The first general frost of the season in central and northern districts east of the Mississippi occurred the night of October 17–18. The occurrence of this frost was covered by the regular forecasts and by special warnings, which were issued on the morning of the 17th and telegraphed throughout the districts referred to.

In the latter part of December, 1900, and during January, 1901, severe frosts occurred in central and southern California and in Arizona, of which special warnings were issued in advance. Commenting upon these forecasts, the Riverside (Cal.) Independent remarked editorially as follows:

The Weather Bureau reports and predictions this season so far have been remarkably accurate, and their value can hardly be overestimated.

On the morning of February 23, 1901, the following special warning was telegraphed from Washington to Jacksonville, Fla., with instructions to give it the widest possible distribution throughout the State:

Temperature will fall to-night to a minimum of between 20° and 25° at Jacksonville and to freezing as far south as Tampa, with frost extending somewhat south of the latitude of Jupiter.

Frost occurred as predicted, and the minimum at Tampa, Fla., the night of the 23d was 32°.

Over 500 telegrams were sent from the Weather Bureau office at Jacksonville, and the railroads of the State energetically cooperated in disseminating the warnings. Fruit and vegetable growers estimated the value of orange bloom, vegetables, and strawberries known to have been saved as a result of the warnings at over $100,000.

FLOOD WARNINGS.

The most important floods of the year occurred in the Ohio Valley in April, 1901, a detailed description of which was published in the Monthly Weather Review for April, 1901. The character and value of the warnings which were issued by the Weather Bureau in connection with the floods is indicated by the following editorial in the St. Louis (Mo.) Republic of May 7, 1901:

Hereafter it may be assumed that the Weather Bureau man will be held in high esteem throughout the Ohio Valley. During the flood period now gradually closing millions of dollars have been saved through the warnings that have been given by this branch of the Government service.

It is so seldom that the Weather Bureau receives credit for correct forecasts that the widespread commendation for the timely warnings that have been given the people of the inundated section is notable.

REPORT OF THE CHIEF OF THE BUREAU OF ANIMAL INDUSTRY.

U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF ANIMAL INDUSTRY,
Washington, D. C., September 7, 1901.

SIR: I have the honor to submit herewith a report of the operations of this Bureau for the fiscal year ended June 30, 1901.

Respectfully,

D. E. SALMON, *Chief.*

Hon. JAMES WILSON, *Secretary.*

WORK OF THE YEAR, WITH RECOMMENDATIONS.

The past year has been one of great prosperity in all branches of the animal industry. Prices have been good, markets have been active, and there has been an outlet in foreign countries for most of our surplus.

GROWTH OF THE BUREAU'S WORK.

The work of the Bureau has been greater than ever before, and yet the facilities at its command have not been sufficient to meet the demands that have been made upon it. The magnitude of the interstate and foreign traffic in animals and their products and the amount of work required to inspect and certify to these subjects of commerce are enormous. The diseases which appear in various parts of our extensive territory each year are numerous, and there is urgent need for assistance to protect the affected communities from disastrous losses. Of scarcely less importance is it to investigate the incorrect reports of Old World plagues which are from time to time alleged to exist among our animals. These mistaken reports alarm our stock raisers, injuriously affect our markets, and lead to prohibitions by foreign countries.

OUTBREAKS OF ANTHRAX.

The past year has been remarkable for the number and wide distribution of the outbreaks of anthrax. There are certain regions where this disease appears to be indigenous, as on the alluvial soils of portions of the southern part of the Mississippi Valley, and where it apparently develops when the conditions of the soil and climate are favorable. There are, however, other outbreaks which occur as the result of importing the contagion with hides, hair, wool, etc. In either case the stock owners should be promptly informed of the nature of the disease, of its communicability to man, of its deadly nature, and of the measures required to arrest its spread.

One of the greatest resources in the fight against anthrax is the use

of a properly prepared vaccine. That supplied commercially is often unreliable. Sometimes it is so virulent that it is more dangerous than the disease it is designed to prevent; in other cases it is so lacking in activity as to be worthless. There is, however, no good reason why anthrax vaccine of proper strength should not be supplied, as blackleg vaccine has long been supplied, by this Bureau. It is only a question of having the laboratory facilities and the money for properly conducting the work.

Arkansas, Louisiana, Mississippi, and Texas have lost millions of dollars' worth of horses, mules, cattle, and other animals, and an undetermined number of human beings from this disease. Other States, among them Pennsylvania, New York, Illinois, Wisconsin, and the Dakotas, have suffered to a greater or less extent. Numerous requests for vaccine have come from the people of these sections, but it could not be supplied in any instance. More laboratory facilities and more men of thorough training must be had before this line of work can be attempted.

BLACKLEG VACCINE.

Blackleg vaccine has been supplied in greater quantities than ever before, but the facilities which the Bureau now has are not sufficient to keep pace with the demands. More than 1,500,000 doses were distributed to cattle raisers last year, and this gave the most favorable results, the losses in the vaccinated herds being less than 1 per cent of the total number.

TUBERCULOSIS.

The tuberculosis question is one which demands immediate and thorough investigation. This disease is increasing among our cattle and swine, probably also among our sheep. The value of the meat which must be destroyed each year on account of it is becoming considerable. Questions have recently been raised as to the communicability of animal tuberculosis to mankind which are of the highest importance, and should be settled at an early day. The disease is one which not only threatens the prosperity of the farmers who own the stock, but according to the weight of medical opinion at this time it is also a menace to the consumers of their products. Fortunately, the cattle of the United States are affected in less proportion than are those of any other large cattle-producing country, and it is the part of wisdom to arrest the plague now rather than to wait until the losses become greater, and the task of eradication still more difficult to accomplish.

PRESENT SALARIES FOR SCIENTISTS INSUFFICIENT.

The scientific work which is required in connection with the manufacture of anthrax vaccine, blackleg vaccine, tuberculin, mallein, and the study of diseases is of the most difficult character, and is always attended by the danger of infection with the contagion of such fatal diseases as anthrax, tuberculosis, glanders, or rabies, or with blood poisoning from handling the septic products developed in such diseases. There are few men who are qualified to do such work, and their salaries should be proportional to the difficulties and dangers which they necessarily encounter. The pay of the scientific men connected with this Bureau has been so inadequate that it is difficult to induce

competent men to remain after they have learned our methods and had the advantage of a brief period of experience in the laboratory.

The result is that much of our time is spent in training young men who, as soon as they become competent, are called away to other positions where the salaries are higher. It has been said that these men remain in the country, and the country has the benefit of the training which they have received here; and while this is true, to a certain extent, it does not improve the situation from the farmer's point of view. These men do not necessarily continue in the same line of work; some of them go as teachers where they are no longer engaged in original research; some of them go into commercial houses, and others may go into medical or veterinary practice. In all of these cases their services are absolutely lost to the field of agricultural investigation. It will probably be generally admitted that the Department of Agriculture exists for the benefit of the agricultural industry, not to educate men for professors in universities, for experts in commercial houses, or for practitioners of medicine. And, while it is desirable that men should be educated somewhere for such lines of work, their training is not a fair compensation to our stock raisers for delay in the solution of urgent and important problems or for failures to bring relief from constant and distressing losses.

While we stop to train men to fill the places vacated, the expense of maintaining the laboratory goes on, the salaries now established go on, the experiment station must be kept in operation, but the work does not progress as it should. During the past six years the position of chief of the pathological division has three times become vacant, and most of our investigators have been tendered positions with higher salaries than they are receiving here. As it requires at least two years for a new man, however competent he may be by education and preliminary training elsewhere, to become familiar with our methods, to understand our problems, and to get any reliable results from his experiments, it is readily seen that such frequent changes almost prevent the solution of the more serious and complicated questions with which we are confronted. To elucidate the practical questions connected with the control of hog cholera, for instance, requires a long series of experiments without interruption, and conducted by the same person.

It should be clear, however, that these remarks relative to educational work are not antagonistic to the policy of taking young men from colleges and technical schools into the laboratories and training them for the higher and more responsible positions. This is undoubtedly the best plan for securing competent and experienced investigators, who upon promotion are able to take up the most advanced work with the least loss of time. It is not the educational process that the writer deplores, but the loss of men from this service almost as soon as they have been fitted for it at such an expense of time and money.

It is therefore very desirable and, indeed, essential to the successful prosecution of the scientific work which the Bureau should do that the salaries be made equal to those paid in educational institutions and in other branches of scientific work conducted by the Government. There is no apparent reason why a scientific man should work for less compensation in the Department of Agriculture than in other departments of Government service requiring no more training and no greater competency. As a matter of fact, they will not do so, and the work of agricultural investigation suffers accordingly. I would

therefore most urgently recommend that the compensation of the chiefs of the scientific divisions of this Bureau and their more important assistants be made commensurate with the high class of work required of them.

MEASURES TO EXCLUDE CONTAGION.

The maintenance of properly equipped and efficient quarantine stations is essential to the protection of our live stock from imported contagion. The increased value of animals of all kinds in the United States has led to larger importations and to correspondingly greater danger of bringing disease into the country. There may be a reasonable doubt as to whether it is necessary or even advantageous to bring any new breeds of animals or any fresh blood of old breeds into this country, but there can be no question that it would be far better to have no more breeding stock imported than to allow the entrance of diseased animals, which are capable of spreading contagion among our domestic stock and causing heavy loss to our farmers for years to come. Foreign countries in which we desire to market live animals are from time to time making inquiries as to the value of our quarantine stations and the protection which we give to our live-stock industry. It may be, therefore, that the continuance of our exports in the countries to which we now ship, as well as the extension of our trade to countries where it is desired to establish a trade, is dependent upon our exclusion of diseased animals.

The quarantine stations now in use have been sufficient in the past, but with the growth of the import trade more facilities are required. Ground for a station for the quarantine of animals entered at the port of New York has recently been purchased at Athenia, N. J., and buildings are now in course of erection. The increased cost of building material and the greater number of buildings required make it impossible to equip properly this station for the money which has been appropriated. The work should therefore be continued another year. There is also great need for a quarantine station on the water front, to which animals can be taken by boat in all cases where there is any suspicion that they may have been exposed to disease. This would be far safer than transportation by rail, as at present. There is no place so situated available near New York, and it would therefore be advisable to purchase land for such a station somewhere on the extensive shore line in the vicinity of Baltimore. The quarantine station for the port of Baltimore, now located at St. Denis, Md., needs extensive repairs or entirely new buildings, and consequently this would be a favorable time to make a change.

With a station such as is contemplated, animals might be admitted which we are now obliged to exclude. All cattle, sheep, and swine from the Continent of Europe, for example, are now forced to enter through the Canadian quarantines, because of the prevalence of foot-and-mouth disease in Europe and the danger that would be connected with the transportation of such animals by rail immediately after landing, even if they were apparently sound on inspection. In the history of the quarantine stations, before they were administered by the Bureau of Animal Industry, there are several instances in which foot-and-mouth disease was not detected by the inspection on shipboard, although the animals were actually affected. Such instances are liable to occur again, and emphasize the importance of adopting every possible precaution. An outbreak of foot-and-mouth disease would cause

not only great loss to our stockmen whose animals were affected, but it would probably lead to the prohibition of our cattle and sheep by other countries. The recent destruction of the magnificent live-stock trade of Argentina by an outbreak of this disease should be a warning as to what may at any time happen to the United States if our vigilance is relaxed or if we fail to adopt every precaution that may be reasonably suggested from an intimate knowledge of this elusive contagion.

A disease which can not be excluded even by quarantine is tuberculosis. The slow and insidious nature of this disease, the difficulty of detecting it, the fact that it may be communicated to all species of animals, and its generally fatal character, make it by far the most dangerous and injurious of the plagues which threaten our live stock. Unfortunately, it has already become so well known that familiarity has bred contempt, and its powers for evil are not fully appreciated. Notwithstanding the tuberculin test, it is to be feared that tuberculous cattle sometimes gain entrance to this country by the fraudulent practice of treating them with this agent before the regular test is made, and thus putting them into a condition which prevents them from showing its effects. As animals imported for breeding purposes are generally sold either to some breeder of high-class stock or to some farmer or dairyman who is grading up his cattle, every tuberculous animal imported is liable to start a new center of disease, and every center of disease so established becomes a distributing point for the contagion and causes an amount of damage which can not be fully appreciated until years afterwards. As has been officially determined of a celebrated herd in Canada, wherever cattle from that herd were found there also was found tuberculosis, "and the Bow Park herd, which was looked upon as one of the greatest benefits to the farming community in western Canada, was really a danger, because it disseminated tuberculosis among the ordinary farmers' herds."

In the same way our owners of pure-bred herds are not only courting danger to their own herds when they admit doubtful cattle from abroad, but they are liable to disseminate the disease through the herds of many innocent purchasers of their stock. Notwithstanding this fact, there is an unreasonable and insistent demand by the speculators and others interested in the handling of such stock that the regulations be relaxed to such an extent that the detection of diseased cattle would be impossible. The very fact of this insistence indicates that the present regulations are found inconvenient, and that a profitable though dangerous traffic has been checked. It is needless to add that these regulations should be enforced in the interest of our farmers, in the interest of the public health, and in the interest of our export trade, and if the present restrictions are not sufficient to exclude disease they should be added to and made more rigid until the object is accomplished.

FOREIGN MARKETS FOR LIVE STOCK.

The number of cattle and sheep exported during the past year shows a gratifying increase of this branch of our trade. Most of these animals have gone to Great Britain for immediate slaughter. It is believed that the time has come when an effort should be made to introduce our fine breeding animals to the stockmen of other countries. Our herds are now as good as any in the world. The importation of breeding stock from Europe is, except in very rare cases, for speculation

only, not because the blood is needed to improve our animals; and during recent years the tendency of such importations has often been detrimental rather than beneficial. This tendency is fully appreciated by the breeders, as is shown by the almost prohibitive registration fee which has been imposed by the Shorthorn Association.

The Argentine Republic has long been importing high-priced breeding stock from Europe, but recently has prohibited the trade on account of the danger of admitting disease from that section of the world. The stockmen of Mexico begin to realize the benefits which would accrue to them by producing animals which would conform more nearly to modern requirements. South Africa, stripped of its live stock by the exigencies of a long and stubbornly contested conflict, must in the near future be rehabilitated and begin anew the development of an extensive pastoral industry. What is more natural than that the finely bred and healthy herds of the United States should be drawn upon to supply the wants of these countries?

Just at present the demand for such stock at home is almost too great to favor very active efforts to build up an export trade. But this condition will not long continue because the stimulus of good prices will lead to much greater production and then a foreign outlet will be very desirable. An export trade can only be built up, however, by supplying the highest quality of stock and that which is free from disease. Of foot-and-mouth disease and pleuropneumonia we are free, and probably shall remain free, but the attention of the world is now turned to tuberculosis, and we should put our herds in condition to also guarantee freedom from that plague. Argentina, Australia, and New Zealand have felt the disastrous effects of tuberculous breeding stock, and it is not likely that any country hereafter will admit such animals without the most rigid tests. Neither should animals be admitted into the United States without these tests, if the reputation of our herds is to be maintained.

IMPROVEMENT IN CATTLE SHIPS.

There has been great improvement recently in the vessels carrying live stock to Great Britain, as a consequence of the Department regulations requiring wider alleyways and better ventilation. In some of the older ships it was impossible to widen the alleys to the extent demanded without too great interference with the carrying capacity, and in these the object sought was attained by running alleys athwartship and increasing the ventilation. It is believed that now, after a continuous struggle for ten years, these vessels are at last in condition to carry animals humanely and without unnecessary loss. During this long period one concession after another has been obtained from the transportation companies, some willingly and some unwillingly, with the result that a gradual improvement has followed.

There remains still in an unsatisfactory condition the method of securing attendants to take care of the cattle during the ocean voyage. At present, many of these men are ignorant foreigners, unable to speak our language, who are engaged under misrepresentation as to the character of the work and with promises of compensation and of a return passage which are never made good. The result is great hardship and cruelty to the men and lack of attention to the cattle, because the men are not familiar with the work and only perform it under compulsion. No efficacious method of correcting this evil has yet been devised, but it is now receiving the attention of the several

Departments of the Government which are interested, and it is hoped that some practical measure will be evolved.

INCREASE IN MEAT INSPECTION.

The number of cities where meat inspection is conducted has been increased by 13 per cent during the year; the number of carcasses inspected at the time of slaughter increased by 2,300,000. This, of course, means that the expense of the inspection is also increasing. However, meat inspection is a service of great value to the country, protecting consumers from diseased meats and maintaining the reputation of our animal products in both home and foreign markets. At present the field is not covered. There are many abattoirs asking for inspection to which the service can not be extended. The work must therefore continue to grow for some years, but arrangements should soon be made to inspect all meat shipped from one State to another. Until this is done the objects in view when the service was established have not been entirely accomplished.

INSPECTION OF DAIRY PRODUCTS FOR EXPORT.

At the last session of Congress provision was made for the inspection and certification of dairy products intended for exportation. The regulations for carrying this measure into effect have been made and the inspection will soon be commenced. The cost of this inspection can not be estimated in advance, but it will necessarily increase the Bureau expenditures, though not largely, considering the benefit that should accrue. At a time when butter substitutes, renovated butter, and all grades of dairy and creamery butter are exported from this country, it is necessary for the protection of our pure butter in the markets of the world that there should be a proper official inspection and certification before the goods leave this country. Practically the same may be said in regard to cheese. The trade is large and increasing, and is entirely worthy of this degree of Government supervision. Whatever the cost may be, therefore, it is an expenditure wisely made, and one which will be of assistance to the dairy industry. It is the intention to extend this inspection gradually, first certifying to the better grades of pure butter and allowing other grades to go upon their merits, but later perhaps marking all grades.

STATE RESTRICTIONS ON INTERSTATE CATTLE TRAFFIC.

Inspection laws and regulations are enforced in a few States, which duplicate the inspection made by this Bureau, of animals that are shipped from one State to another, and for such State inspection fees are demanded which constitute a serious burden on this branch of interstate commerce. The State inspection and tax is applied to live stock which is simply in transit across the territory of the State as well as to that which is destined to remain within its borders. It is plain that the imposition of such taxes on the live-stock traffic by a few States may be followed by the general adoption of this method of raising revenue, and that this would work to the great disadvantage or possibly to the ruination of the stock industry in sections of the country which are remote from market. It would be next to impossible, for instance, to ship cattle from Massachusetts to California, if every intermediate State whose territory was crossed en route should

require inspection and exact a fee for the same. So menacing is this situation to the great cattle industry of the Southwest and West that efforts are being made by the National Live Stock Association to bring the matter before the Supreme Court of the United States, in order that a decision may be rendered as to the constitutionality of these State restrictions upon interstate commerce when Congress has already legislated upon the subject and provided an adequate inspection service. I would recommend that the Department of Agriculture take such action as it properly may to interest the Department of Justice and to secure its assistance in presenting the case.

INSPECTION DIVISION.

MEAT INSPECTION.

The number of abattoirs and packing houses where cattle, sheep, calves, and hogs and their products were inspected during the year was 156. The number noted in the preceding report was 148. The number of localities where the work was conducted increased from 45 to 51. Horses were inspected at one other abattoir.

The following table shows the increase year after year in the number of abattoirs where inspection has been maintained and the number of cities where the work is done:

Number of abattoirs and cities where inspection was maintained, 1892 to 1901.

Fiscal year.	Number of abattoirs.	Number of cities.	Fiscal year.	Number of abattoirs.	Number of cities.
1892	28	12	1897	128	33
1893	37	16	1898	135	35
1894	46	17	1899	138	41
1895	55	19	1900	148	45
1896	102	26	1901	156	51

The following table shows the numbers and kinds of animals inspected before slaughter, and the number of these that were rejected for some cause apparently unfitting them for food purposes, the final condemnation or passing of the carcass depending upon the result of the post-mortem inspection:

Ante-mortem inspections for the fiscal year 1901.

Kind of animal.	For official abattoirs in cities where inspections were made.	For abattoirs in other cities and miscellaneous buyers.	Total inspections.	Rejected (subject to result of post-mortem inspection).	
				At abattoirs.	In stock yards.
Cattle	5,375,315	4,904,883	10,280,198	318	14,727
Sheep	6,662,032	4,571,827	11,233,859	890	7,682
Calves	400,241	266,235	666,476	1,635	2,173
Hogs	24,486,130	9,700,656	34,186,786	5,812	71,286
Horses	1,991		1,991	3	
Total	36,925,709	19,443,601	56,369,310	8,658	95,868

There was an increase over last year in the number of all classes of animals inspected, with the exception of a decided decrease in the number of horses, there being but a third as many of these as

during the previous year. The total number of ante-mortem inspections this year exceeds the total number of last year by 3,281,316. There was an increase of 2,700 rejections at abattoirs and a decrease of 57,693 rejections at stock yards.

The following table, showing the total number of animals inspected at time of slaughter for abattoirs having inspection, for the fiscal years 1891 to 1901, is given for the purpose of comparison:

Number of animals inspected at slaughter for abattoirs having inspection, fiscal years 1891 to 1901.

Fiscal year.	Cattle.	Calves.	Sheep.	Hogs.	Horses.	Total.
1891	83,889					83,889
1892	3,167,009	59,089	583,361			3,809,459
1893	3,922,079	92,947	870,512			4,885,538
1894	3,861,594	96,331	1,020,764	7,648,146		12,626,835
1895	3,704,042	116,093	1,428,601	13,616,539		18,865,275
1896	3,985,484	256,905	4,629,796	14,250,191		23,122,376
1897	4,242,216	273,124	5,209,161	16,808,771		26,533,272
1898	4,418,738	244,330	5,496,904	20,893,199		31,053,171
1899	4,382,020	246,184	5,603,096	23,836,943	3,332	34,071,575
1900	4,841,166	315,693	6,119,886	23,336,884	5,559	34,619,188
1901	5,219,149	413,830	6,639,212	24,642,753	1,992	36,916,936

The inspection of animals at time of slaughter, with the number of carcasses and parts of carcasses condemned and tanked, is shown in the next table. The number of condemnations for trichinosis is given under the head of "Microscopic inspection of pork."

Post-mortem inspections for the fiscal year 1901.

Kind of animal.	Number of inspections.			Carcasses condemned.			Parts of carcasses condemned at abattoirs.
	For official abattoirs.	On animals rejected in stock yards.	Total.	For official abattoirs.	Animals rejected in stock yards.	Total.	
Cattle	5,219,149	25,005	5,244,154	8,505	3,777	12,282	8,701
Sheep	6,639,212	7,349	6,646,561	2,936	1,513	4,449	91
Calves	413,830	750	414,580	385	150	535	24
Hogs	24,642,753	77,729	24,720,482	47,240	7,394	54,634	10,973
Horses	1,992		1,992	103		103	
Total	36,916,936	110,833	37,027,769	59,169	12,834	72,003	19,789

In addition to the carcasses condemned as above and to those condemned for trichinosis, the table below shows the number tanked for other reasons—bodies of dead animals taken from cars or pens at abattoirs, or animals that, after inspection in the stock yards, had died from disease or injury or were killed by municipal inspectors:

Manner of death.	Cattle.	Sheep.	Calves.	Hogs.	Horses.	Total.
Died in stock yards	316	1,147	118	2,215		3,796
Killed in stock yards	497	600	158	9,203		10,458
Died at abattoirs	239	1,061	257	15,388	27	16,972
Total	1,052	2,808	533	26,806	27	31,226

Below is a statement of the total number of carcasses and parts condemned and tanked, with the causes of condemnation, at the time of

slaughter, and including the carcasses of animals found dead and those killed by city inspectors:

Causes of condemnation of carcasses and parts of carcasses for fiscal year 1901.

Cause of condemnation.	Cattle.		Sheep.		Calves.		Hogs.		Horses.
	Carcasses.	Parts.	Carcasses.	Parts.	Carcasses.	Parts.	Carcasses.	Parts.	Carcasses.
Actinomycosis	1,355	629	2		5		26	3	
Tuberculosis	6,454	256	134		8		8,650	44	
Cholera and swine plague							37,862		
Texas fever	17				12				
Echinococcus	1	1	1					620	
Measles				10			24		
Scabies			26				87		
Eczema							6		
Erysipelas							23		
Cancer	63		2				18		
Tumor	21	8	5		1		480	668	
Abscess	98	6,485	110	11	6	4	597	1,570	6
Pneumonia	213		177		15		978		3
Pleurisy	13		23	8	1		88	13	1
Bronchitis									
Carditis							2		
Enteritis	36		62		14		286		3
Peritonitis	177		52		16		373		1
Metritis	9		6				117		3
Nephritis	7		63		2		44		
Uræmia	1		27				30		
Mammitis	1		4				15	400	
Septicæmia	268		212		6		684		17
Pyæmia	200		183		12		1,899		4
Gangrene	12		6				33		1
Anæmia, emaciation, marasmus	2,173		1,835		47		299		11
Ascites	19		51		1		27		
Jaundice	26		258		4		774		
Extreme temperature, various causes	2		41		4		595		
Pregnancy	76		25				269		40
Recent parturition	15		15				63		
Hernia	2		4				31		
Downers, bruised, injured, etc	1,020	1,322	759	62	52	20	254	7,655	4
Asphyxiation	3								
Sick			31						
Caseous lymphadenitis			333						
Impaction of rumen			1						
Distoma			1						
Melanosis					1				2
Polyarthritis					1				
Too young					327				
Lymphangitis									1
Pharyngitis									1
Nasal discharge									2
Fistula									1
Distemper									2
Dead from various causes	555		2,208		375		17,603		27
Killed by city inspectors	497		600		158		9,203		
Total	13,334	8,701	7,257	91	1,068	24	81,440	10,973	130

The meat inspection tag or brand was placed upon 18,977,943 quarters, 332,399 pieces, and 2,844 sacks of beef; 6,626,729 carcasses of sheep; 412,721 carcasses of calves, and 1,101,961 carcasses of hogs, and 752,805 sacks of pork.

The stamp signifying that the contents had received the ordinary inspection was affixed to 21,496,109 packages—6,394,065 of beef, 41,993 of mutton, 112 of veal, 15,059,118 of pork, and 821 of horseflesh.

There were sealed (with numbered seals, of which a record is kept) 68,495 cars containing inspected meat products for shipment to official abattoirs and other places.

The number of certificates of ordinary inspection issued for meat

products for export, exclusive of horseflesh, was 36,998. Of beef, there were 1,749,817 quarters, 330 bags, 36,554 pieces, and 1,437,553 packages, with a weight of 452,830,373 pounds; of mutton there were 452 carcasses and 18,990 packages, weighing 894,648 pounds; of pork there were 53,203 carcasses and 717,749 packages, the weight being 231,144,938 pounds. These figures show an increase in the exports of beef and mutton, but a falling off in pork, the total difference being (in round numbers) 26,000,000 pounds less than in 1900—the gain of 15,000,000 in beef being offset by a loss of 40,000,000 in pork. In 1900 there was an increase over 1899 of 77,000,000 pounds in beef, and a decrease of 6,000,000 pounds in pork.

There were 9 certificates given for horseflesh, covering 880 packages, having a weight of 249,900 pounds.

The following table shows the quantities of beef, mutton, and pork for export which received the certificates of inspection:

Quantities of beef, mutton, and pork for export upon which certificates of inspection were issued 1898 to 1901.

Fiscal year.	Beef.	Mutton.	Pork.
	Pounds.	*Pounds.*	*Pounds.*
1898	339,650,091	324,996	244,956,482
1899	360,843,856	525,705	278,696,435
1900	438,138,233	680,897	272,050,663
1901	452,830,373	894,648	231,144,938

The expense incurred on account of the work outlined above was $566,809, an increase over last year of $61,528.48. The cost of each of the 56,369,310 ante-mortem inspections averaged 1.01 cent.

The following statement shows the cost of each ante-mortem inspection from 1893 to 1900, inclusive:

	Cents.		Cents.
1893	4.75	1898	0.80
1894	1.75	1899	.88
1895	1.10	1900	.95
1896	.95	1901	1.01
1897	.91		

MICROSCOPIC INSPECTION OF PORK.

The number of carcasses of pork examined was 733,196, classified as follows: Class A (free of all appearance of trichinæ), 715,529, or 97.59 per cent; Class B (containing trichina-like bodies or disintegrating trichinæ), 8,668, or 1.18 per cent; Class C (containing living trichinæ), 8,999, or 1.23 per cent. There is little change in the percentages; Class A slightly increased, with a corresponding diminution in Class C.

There were 9,001 trichinous carcasses disposed of during the year; the weight of these was 2,003,858 pounds. Over half of this quantity was made into cooked meat; the remainder was tanked.

The decrease in the exports of microscopically examined pork continued, so that the quantity inspected for export amounted to less than two-thirds of that of the year before. The number of certificates issued was 6,188; the number of packages was 127,017, with a weight of 35,942,404 pounds. For comparison the quantities inspected for

export to countries requiring microscopic certificates for 1892 to 1901 are given:

	Pounds.		Pounds.
1892	22,025,698	1897	42,570,572
1893	8,059,758	1898	120,110,356
1894	18,845,119	1899	108,858,149
1895	39,355,230	1900	55,809,626
1896	21,497,321	1901	35,942,404

The expenditures on account of this work amounted to $114,102.76. This gives an average for each examination of 14 cents; for each pound exported, of 0.317 cent.

INSPECTION OF VESSELS AND EXPORT ANIMALS.

The number of certificates of inspection issued for American cattle exported to Europe was 1,563; the number of clearances of vessels carrying inspected live stock was 988. There was a notable increase in the number of cattle and sheep exported, the former being greater than in any year since 1898 and the latter the largest since 1896. There was a decline in the exportation of horses. All of the animals in the following table were exported to Great Britain, with the exception of 80 cattle, 590 sheep, and 858 horses to Belgium, and 914 horses to Germany:

Number of inspections, etc., of American and Canadian animals, fiscal year 1901.

Kind of animal.	American.				Canadian.		
	Number of inspections.	Number rejected.	Number tagged.	Number exported.	Number inspected.	Number rejected.	Number exported.
Cattle	804,578	1,682	400,385	a 384,722	33,385	13	33,372
Sheep	398,845	606	.....	b 227,934	49,209	67	49,142
Horses	47,679	263	24,235	c 24,952	582	.....	582

a 9,780 via Canada. b 13,552 via Canada. c 267 via Canada.

Besides the above-mentioned animals exported to Europe, there were also inspected 800 cattle, 514 sheep, and 1 horse for Bermuda and 82 cattle for Brazil.

The number of American and Canadian animals landed alive at the foreign animals wharves in London, Liverpool, and Glasgow and inspected by inspectors of this Department stationed at those ports, together with the number and percentage lost in transit, is shown as follows:

Number of animals inspected at time of landing in London, Liverpool, and Glasgow and loss in transit, fiscal year 1901.

From—	Cattle.			Sheep.			Horses.		
	Landed.	Lost.		Landed.	Lost.		Landed.	Lost.	
	No.	No.	Per ct.	No.	No.	Per ct.	No.	No.	Per ct.
United States	366,629	868	0.24	207,477	1,913	0.91	22,823	400	1.72
Canada	28,975	110	.38	46,850	425	.90	528	10	1.86
Total	395,604	978	.25	254,327	2,338	.91	23,351	410	1.73

INSPECTION OF IMPORTED ANIMALS.

The numbers and classes of animals imported from Mexico and inspected at ports of entry along the international boundary line are given in the table on the next page.

Importation of Mexican animals, fiscal year 1901.

Port of entry.	Cattle.	Sheep.	Swine.	Goats.	Horses.	Asses.
Eagle Pass, Tex	3,640				3	6
El Paso, Tex	49,413			2	94	
Naco, Ariz	207					
Benson, Ariz	29					
Nogales, Ariz	41,682			143		2
San Diego, Cal	1,680	1,357	37	1,272		1
Total	96,651	1,357	37	1,417	97	9

Through ports on the seacoast animals not subject to quarantine were imported as follows:

From—	New York.		Boston.		San Francisco, horses.	Total.
	Horses.	Mules.	Horses.	Shetland ponies.		
Europe	1,217		23	3		1,243
Cuba	16	700				716
Brazil		2				2
Bermuda	16					16
Porto Rico	4					4
Hawaii					5	5
Manila					7	7
Mexico	3					3
China					1	1
Canada			23	1	3	27
Total	1,256	702	46	4	16	2,024

There were also 1 deer imported from Manila through San Francisco and 6 sheep from Canada through Boston.

A report of the animals imported and quarantined at different stations will be found under the head "Miscellaneous division."

CONTROL OF CONTAGIOUS DISEASES.

Southern cattle inspection.—The supervision of the movement of cattle from the area quarantined on account of Southern, or Texas, or splenetic, fever of cattle, due to the presence of the tick (*Boophilus annalatus*, formerly called *Boophilus bovis*), which carries the infection, involved the proper yarding in the quarantine divisions of the different stock yards of 1,168,935 head of cattle, during the quarantine season of 1900. To transport these cattle required 43,952 cars, each of which had to be placarded, and all of the waybills, manifests, and bills of lading accompanying the shipments had to state that the cattle were Southern cattle. The number of cars cleaned and disinfected was 45,425.

In Texas, 307,658 cattle were inspected and identified by brands as originating outside of the quarantined district and were permitted to be moved north for grazing.

Scabies in sheep.—The number of sheep inspected in stock yards, at feeding stations, and at many places throughout the West, in order to prevent the shipment of sheep affected with, or that had been exposed to, scabies, amounted to 7,912,724.

The number of sheep dipped under the supervision of Bureau inspectors was 1,034,368.

For shipments of sheep that were found free of infection, certificates of inspection were given.

MISCELLANEOUS DIVISION.

The miscellaneous division has a general supervision of the accounts and other work of the Bureau of Animal Industry, as follows: Salaries; reimbursement of expenses incurred by its officers and employees in travel and at various stations; apparatus and supplies for the various divisions, their laboratories, the experiment station, and quarantine stations; all accounts of every character that are paid from the appropriation for the Bureau of Animal Industry; the preparation of an itemized report to each Congress, showing in detail the character of expenditures and the use of the appropriation; the making out of all appointments, transfers, promotions, furloughs, reinstatements, resignations, and dismissals; the making of requisitions and informal bids for all materials and supplies used throughout the work of the Bureau, and the necessary letter writing incident thereto, together with the supervision of the work of the animal quarantine stations. This latter work includes the inspection and quarantine of imported cattle, sheep, and other ruminants, and swine, and the making of permits for their importation and keeping the records pertaining to quarantines. The division also has charge of the preparation of replies to numerous letters requesting information in regard to the diseases of animals and poultry, their causes and treatment, and various other matters pertaining to breeds, breeding, and care of domesticated animals, and allied subjects. This is the character of the routine work performed each year.

QUARANTINE OF IMPORTED ANIMALS.

The variety of kinds and the number of ruminants other than cattle and sheep imported during the fiscal year has been increased somewhat through the importations made more especially for exhibit at the Pan-American Exposition. These animals have all been subjected to inspection and quarantine, the length of the quarantine period being fixed in accordance with the requirements for the subdivision of the class to which the animal belonged.

The imports of animals from Canada not subject to detention at quarantine stations comprised 39,572 cattle, 199,325 sheep, 3,227 horses, 435 hogs, 1 goat, 7 deer, and 3 elks—total, 242,570 animals.

The following table shows the number and kinds of animals detained in quarantine for the requisite time:

Number of animals imported and quarantined at different stations, fiscal year 1901.

Stations.	Cattle.	Sheep.	Hogs.
Littleton, Mass	11	128	7
Garfield, N. J	359	270	66
Port Huron, Mich	11		
Detroit, Mich	5		
Sault Ste Marie, Mich	31		2
Ogdensburg, N. Y	3		1
Hogansburg, N. Y	6		2
Messina, N. Y	4		
Buffalo, N. Y	7		
Niagara Falls, N. Y	3		
Richford, Vt	10		1
St. Albans, Vt	2		
Newport, Vt	16	14	
Island Pond, Vt		3	
Beecher Falls, Vt	33	10	
Houlton, Me	55	73	2
Vanceboro, Me	1	17	
Eastport and Calais, Me	2	10	
Total	559	525	81

There were also imported through the port of New York and quarantined, under the supervision of the superintendent of the Garfield quarantine station, the following: Antelopes, 4; buffalo, 4; giraffe, 1; guanacos, 2; aoudads, 2; nilgaus, 2; camels, 16; goats, 9; alpacas, 2; chamois, 1; deer, 37; zebu, 1; llamas, 9; gazelles, 3; trick bull, 1; other wild animals, 24—total, 118. Add to this the animals reported in the table above, we have a total of 1,283 imported animals that were quarantined.

An official veterinarian was stationed at London, England, in accordance with the requirements of Bureau of Animal Industry order No. 79, issued by this Department under date of November 10, 1900, which provides for the testing with tuberculin by an inspector of this Department of all cattle over six months old which are to be imported into the United States. This official has tested, in various parts of Great Britain, 161 cattle, for which a permit was desired for shipment to the United States. Of these, 18 were rejected and 143 passed. In Canada the veterinarians of this Department tested with tuberculin 491 cattle, of which 39 were rejected and 452 passed.

OUTBREAK OF MALADIE DU COÏT.

During the last quarter of the fiscal year the work of eradicating an imported infectious venereal disease of horses known as maladie du coït, or dourine, was inaugurated, but owing to the extent of area and the semiwild condition of much of the country over which the disease had spread, as comprised in the Rosebud and Pine Ridge Indian agencies, South Dakota, and parts of Nebraska and Wyoming, little was accomplished beyond the organization of the work. A large number of range horses were rounded up, corralled, and inspected previous to July 1, among which 12 were found to be affected with the disease. These, comprising 2 stallions and 10 mares, were appraised through agreement with the owners and subsequently slaughtered.

Animals found diseased with maladie du coït and killed, and amount of indemnity paid.

Animal.	Owner.	State.	Indemnity.
Stallion	C. W. Denton	Nebraska	$25.00
Mare	S. Chamberlain	Nebraska	20.00
Mare	William Shannon	Nebraska	35.00
Mare	William Shannon	Nebraska	35.00
Stallion	A. A. Lamb	South Dakota	35.00
Mare	P. H. Beguin	Nebraska	10.00
Mare	A. Williams	Nebraska	20.00
Mare	Plenty Birds	South Dakota	20.00
Mare	C. R. Wolfenden	South Dakota	25.00
Mare	L. B. Lessert	South Dakota	30.00
Mare	J. H. Dixon	South Dakota	30.00
Mare	J. H. Dixon	South Dakota	30.00
Total			315.00

The following outline of a report received from Dr. W. S. Devoe, the inspector in charge of this work, exhibits its character:

PINE RIDGE AGENCY,
South Dakota, June 4, 1901.

There are five districts on this reservation—Wakpamini, White Clay, Porcupine, Wounded Knee, and Medicine Root. The animals are rounded up in each district and driven to the final round-up at Pass Creek district, 47 miles from the agency, and then animals which have estrayed from one district to the other during the

year are returned, and animals straying in from sections of the country covering 100 miles in area through Nebraska and South Dakota are claimed by owners and removed by them. At the round-up there were present at least 300 men from different sections—horse buyers from Iowa and Omaha, as well as breeders from Nebraska and South Dakota.

On finding a sorrel mare which was badly diseased, I asked the name of the owner, but no one would acknowledge the ownership of the animal. It was reported by men who knew the brand that she came from the sand hills southeast of Gordon, Nebr. I assumed the responsibility in case a claim was made for indemnity, killed the mare, and made a post-mortem examination to give those present an opportunity to learn more of the nature of the disease. The lesions of maladie du coït were very pronounced.

It was the desire of the breeders and owners of the horses present that the other diseased animals found should be killed on the spot, but not knowing who the owners were and wishing to show the people of this section the disease in its various stages, they were removed to the agency.

Several diseased animals have been slaughtered without indemnity, as they were unclaimed.

BIOCHEMIC DIVISION.

ROUTINE WORK.

The routine work of preparing and shipping branding ink, tuberculin, and mallein has been continued as heretofore. This division has shipped about 560 gallons of branding ink for use in marking inspected meats, 44,410 doses of tuberculin, and 7,188 doses of mallein. The routine work in connection with serum experiments, hog cholera, and swine plague have been continued. A large number of herds were treated in the West during the summer and fall of 1900 and the spring of 1901, and the work is being continued at the present time. In general, the results have been of an encouraging character. At the same time, in some herds other factors have arisen for consideration, which have been and are now being investigated with the hope of throwing additional light on the methods of handling these troublesome diseases.

All this work has entailed a large amount of routine work in the preparation of cultures for the inoculation of animals, in the preparation of serum, and especially in the identification of cultures obtained from herds in the West which have been under treatment. In the progress of this work a number of new varieties of bacilli belonging to the hog-cholera group have been isolated, and other important properties and variations have been carefully studied.

LABORATORY WORK IN TUBERCULOSIS.

The work in connection with tuberculosis has been continued. A number of germs from different species of animals have been secured and cultures made with the purpose in view of obtaining sufficient material for continuing the biochemical and other investigations already begun. The experiments with the serum for tuberculosis in the human being have also been continued at one of the sanatoriums in New York, and the results, as reported by the physician in charge, are of a very encouraging character. Some feeding experiments on chickens have also been conducted during the year and the results are about ready for publication. A number of routine analyses and examinations have been made as the work demanded. A large number of investigations in connection with tuberculosis, in addition to those already named, have been begun, and special attention will be given to the injury to man from bovine, or rather animal, tuberculosis.

There has been some investigation in connection with milk, and

arrangements have been made for a careful study of the bacteriologic and biochemic factors in the production of flavor in butter and cheese. This work will be continued as soon as possible.

Investigations along the lines indicated above will necessarily be continued during the coming year, and other subjects will be taken up as the facilities of the division will permit.

PATHOLOGICAL DIVISION.

The work of the pathological division has been continued along the same lines as during the previous year, with the exception that increased facilities have made it possible to devote more time to the investigation of pathological anatomy. The number of specimens received from the members of the inspection division of this Bureau, as well as from outside parties, have increased by more than 200 per cent over that of any previous year.

BLACKLEG.

The preparation and distribution of blackleg vaccine have, with the increased experience of the assistants detailed to this work, become more of a matter of routine, without sacrificing any of the care and attention which this line of the work demands.

During the fiscal year there were prepared 1,582,625 doses of blackleg vaccine, and of this amount approximately 42,000 doses were discarded as not meeting the requirements for vaccine that is both safe and effective. There were distributed 1,517,560 doses among 12,013 cattle owners. This is an increase of more than 50 per cent over the previous year, when the total number of doses sent out was 1,076,150. The work in this connection has necessitated the preparation and sending of 30,490 pieces of mail, as well as the filing and tabulation of approximately the same number of letters and reports; also the writing and filing of about 20,000 cards for the personal and geographic card catalogue.

From reports received, it is safe to conclude that the loss from blackleg in all herds where this vaccine has been used will fall below 1 per cent, although it is the general impression that the past year has been what is known as a "bad blackleg year" throughout the entire country. It is gathered from information received from all States and Territories that without vaccination the loss from blackleg would have been greatly in excess of that which is generally experienced. The expenses in connection with the preparation and distribution of this vaccine have not exceeded those of the previous year, when only 1,076,150 doses were distributed.

RABIES.

From numerous reports received from various parts of this country it appears that rabies is greatly on the increase among dogs and other domesticated animals. While there has been a decrease in the number of cases of rabies actually proved to have occurred in the District of Columbia, losses from this disease have been general among the horses, cattle, sheep, and hogs in Virginia and some of the Western States, notably Colorado and Missouri, as a result of bites from rabid dogs and wolves.

An outbreak of rabies among the dogs at Rochester, N. Y., in which at least one authentic case of rabies in man occurred, necessitated

stringent measures by the city health authorities in order to suppress the outbreak. Inoculation experiments at this laboratory proved conclusively that the person mentioned had died of rabies, and also that one of the dogs, the head of which was forwarded from Rochester, was suffering with this disease at the time of its death.

In the stock yards of St. Joseph, Mo., the disease appeared among a shipment of cows which were known to have been bitten some time previously by a rabid dog, and which were held at the stock yards for observation. Four of these animals died with symptoms of furious rabies, and the diagnosis was confirmed by inoculation experiments made in this laboratory. Further investigations proved that a number of other domesticated animals had died, with characteristic symptoms of rabies, in the neighborhood from which the cows were shipped.

From the District of Columbia there were received 60 dogs which had been killed as being suspected of rabies. Of these, 15 were proved to have been affected with the disease at the time of their death. It is known that 5 of these dogs had bitten one or more people. These people were notified of the results of the inoculation experiments, in order that they might take the necessary precautions to prevent the development of the disease. Three of these dogs were also known to have bitten cattle, horses, or other dogs.

The health authorities of the District of Columbia also forwarded the dead bodies of 2 cats, 1 of which proved to have been affected with rabies.

TUBERCULOSIS.

Experiments for the eradication of tuberculosis from the dairy herd at the insane asylum at St. Elizabeth, District of Columbia, have been continued, and all the reacting animals have, by this time, been destroyed and replaced with tuberculin-tested cows. The new herd, now consisting of 115 milch cows, will shortly be submitted to a final test in order to ascertain whether any of the purchased animals have developed tuberculosis since they were admitted to the barns of the asylum.

Inoculations on guinea pigs with milk from the reacting cows, in order to test its infectiveness, have developed results of such a nature that it has been considered advisable to repeat them on a smaller scale before the results are published. It may, however, be mentioned that the results are strongly indicative of the frequent occurrence of tubercle bacilli in the milk of cows which have reacted to the tuberculin test, but which do not show clinical symptoms of the disease.

EXAMINATION AND DIAGNOSES OF PATHOLOGICAL SPECIMENS.

In the course of meat inspection, as carried out by the Bureau of Animal Industry, it frequently occurs that inspectors encounter pathological conditions which even the most trained eye fails to recognize. In a majority of cases the inspectors have neither facilities nor time for histological or bacteriological investigations, and it has, therefore, become customary to forward rare or interesting pathological specimens to this division for diagnosis or for confirmation of diagnoses made by the collectors. During the past fiscal year no less than 344 such pathological specimens were received at this division and the great majority of these were collected and forwarded by members of the inspection division. In all cases where possible the specimens

were treated and preserved according to Kaiserling's method, and the anatomical preparations were added to the pathological collection of this division. At the same time the various tissues were hardened, sectioned, stained, and mounted, and the collector notified of the diagnosis made upon microscopical examination. In this manner more than 2,000 permanent preparations have been made and preserved for future reference.

A great number of pen-and-ink as well as water-color sketches have also been made of the anatomical as well as the histological appearances of the specimens, for the purpose of publication with a series of notes upon comparative pathology with special reference to meat inspection. A great deal of this material is now on hand and will be published with as little delay as possible.

DISEASES OF POULTRY.

Of all the various classes of domesticated animals, there is probably none which suffer to the same extent from infectious and contagious diseases as do the domesticated fowls. A number of diseased or dead fowls were received during the past year for diagnosis and advice as to treatment and prevention. An outbreak of an acute and very fatal disease among a large flock of thoroughbred Plymouth Rocks, in northern Virginia, is of special interest. As the disease differed from all those hitherto described, a thorough investigation was made both at the premises where the outbreak occurred and in this laboratory, and a bulletin containing the preliminary notes on an outbreak of apoplectiform septicæmia in chickens, caused by a highly virulent nonpyogenic streptococcus, has been prepared and is now ready for publication.

All the other specimens forwarded were recognized as originating from outbreaks of diseases, the nature and cause of which are more or less well established, and the owners were furnished with information as to the proper means of treatment and prevention.

Under this heading may also be mentioned an epidemic eye disease which prevailed among the crows in the District of Columbia and surrounding country during the past winter. In certain localities great numbers of crows were found dead or dying, all of them exhibiting symptoms of suppurative keratitis and conjunctivitis. An investigation led to the discovery of a small microorganism as the probable cause of this disease, but, on account of failure to obtain healthy crows for experimental purposes, the investigation was not brought to a satisfactory conclusion.

SKIN DISEASE IN HORSES.

During February last attention was called to a skin disease prevailing among the horses on the Umatilla Indian Reservation at Pendleton, Oreg., and specimens of hide of the affected animals were forwarded to this division for diagnosis. As several thousand horses were said to be affected with this disease, it was of importance that a diagnosis be made, and means suggested for its eradication. The probable causative agent was found to be *Sarcoptes* complicated by the presence of a vegetable fungus which has never hitherto been known to possess pathogenic properties. A bulletin has been prepared on the subject and will be published at the conclusion of a series of experiments which are now being undertaken with a view to finding a remedy for the disease.

LOCUST FUNGUS.

During the past year the Division of Entomology has undertaken a series of experiments for the eradication of locusts by means of fungus cultures, with which the swarms of locusts are inoculated. This division has cooperated in this work by preparing more than 200 tubes of these cultures for the Division mentioned.

GLANDERS.

It has devolved upon this division to prove or disprove, by means of inoculation experiments, the diagnosis of glanders among the horses and mules of the War Department which are stationed at St. Asaph, Virginia, after they have been submitted to the mallein test. In all cases where decided reaction has occurred the diagnosis has been confirmed, and the same has been the case with a number of mules which showed a doubtful reaction. Material from an outbreak of glanders near Ames, Iowa, was also referred to this division and the diagnosis confirmed.

FIELD INVESTIGATIONS.

Salt-sick among the cattle in Florida.—During April last an attempt was made to investigate a disease known as salt-sick, or salt-sickness, which is reported to prevail to a considerable extent among the cattle of central and eastern Florida. The time selected was, however, inopportune and no typical specimens of the disease were obtained for examination. From the information gathered it seems probable that the disease is chronic Texas fever, aggravated by malnutrition and tick-worry. If, however, another opportunity presents itself the investigation will be continued this coming winter.

Spinal meningitis.—A number of outbreaks of this disease have been reported from eastern Maryland and Virginia, and in three cases an inspector from this division was sent to the infected districts in response to urgent requests. In no case has it been possible, however, to obtain typical cases for investigation, as the animals affected had either died or recovered by the time the inspector arrived.

THE EXPERIMENT STATION OF THE BUREAU.

HOG CHOLERA AND SWINE PLAGUE SERUM.

The investigations concerning swine diseases, which have been conducted at the experiment station for several years, were continued throughout the year. Fully as much attention was given to the preparation of an antitoxic blood serum for the treatment and prevention of hog cholera and swine plague, as in former years, and some progress was made in reducing the price for which the serum can be manufactured.

EXPERIMENTS IN IMMUNIZING AGAINST HOG CHOLERA AND SWINE PLAGUE.

In addition to the serum work, extensive experiments were made to find a method for immunizing against hog cholera and swine plague without the use of an antitoxine animal. This work has not yet given satisfactory results, but further experiments with this end in view have been planned. One of the great obstacles encountered in these

investigations is the uncertainty with which a proper exposure can be obtained for treated hogs and accompanying control animals. Subcutaneous injections of apparently virulent pure cultures of hog-cholera and swine-plague germs rarely produce anything more than a local inflammatory condition. Attempts to produce disease by feeding the viscera of hogs which have died of hog cholera or swine plague have failed in all but one instance in our recent work at the station, and, in the case of the exception, the disease was of a very mild chronic character. It is quite possible to kill hogs by injecting cultures directly into their circulation; but by this method death is caused rather by a toxæmic overpowering of the entire organism than by an affection at all resembling hog cholera or swine plague, and hence it is questionable whether it can be used advisedly as a test for any system of immunization.

TETANUS.

No cases of tetanus occurred at the station during the year. The antitetanic serum which is prepared at the station is regularly and successfully used to immunize all the animals which, owing to their condition and the work in which they are engaged, are liable to become affected with tetanus. The two horses which supply the serum have gradually been worked up to a state where the one can bear 1,200 cubic centimeters and the other 1,550 cubic centimeters of tetanus toxine at a single injection. This toxine is so virulent that a fraction of a drop on subcutaneous injection kills a guinea pig within twenty-four hours. The antitetanic serum will be tested for its curative value as soon as an opportunity presents itself.

A peculiar effect of the tetanic serum, when used in immunizing doses, has been observed on some cattle. These cattle, within an hour after receiving an injection of from 10 to 15 cubic centimeters of the serum, begin to show edematous enlargements about the eyes, lips, nose, vulva, and rectum. The parts at times swell enormously. The intensely stretched skin over the vulva and rectum assumes a glistening appearance and looks as if the extreme tension would cause a rupture. At times the skin of the neck and abdomen is also affected and is covered with elevations resembling the appearance present in urticaria, or nettle rash. The symptoms disappear after ten or twelve hours, and the recovery of the animal is complete. An effort has been made to determine whether the swelling is due to the antitoxine of tetanus or to something normally present in the blood serum of the horses. The question has not been finally settled, and will receive more attention in the future.

TEXAS FEVER AND TICKS.

Several minor investigations concerning Texas fever were undertaken and are still in progress. Along with other work of this kind a number of ticks were secured through the division of zoology from different countries which are plagued with ticks and a disease similar to or identical with Texas fever. These ticks from Egypt, Cape Colony, Brazil, Australia, and the West Indies are now being cultivated to obtain good specimens for study and comparison with the North American tick, which acts as the transmitting agent of the infectious material of Texas fever.

Little or no progress has been made in the search for a reliable dip to destroy ticks on cattle. A number of new dips have been tested

and found unsatisfactory. Reports from several sources indicate that the ticks can be affected by substances given internally to the cattle on which they are parasitic, but tests of such substances have given no encouraging results at this station. This entire question will receive further attention in the future.

Toward the end of last summer the cattle ticks in the tick fields had become so numerous that it was necessary to spray the fences and adjoining ground every few days, and even with this precaution the cattle in the fields near the tick fields could not be kept altogether clean. In some instances the young ticks crawled from 20 to 30 feet along the ground and up the sides of fences and buildings, where they collected in clumps of several thousands each. Ticks from these clumps in elevated positions could easily be blown considerable distances by moderately strong winds. The solution used for spraying consisted of tar, carbonate of soda, arsenic, and water. It was very effective in destroying the young ticks which had not become attached to a host, but it killed less than 75 per cent of the ticks of all sizes on the cattle which were dipped in it.

An interesting occurrence in connection with the tick experiments was the accidental presence of the parasites on two kittens, which were confined in a small house in the tick field. The house also contained a number of guinea pigs, which remained perfectly clean. The ticks developed very slowly on the kittens, and the latter unfortunately died before any of the ticks matured. The extreme irritation of the skin and the loss of blood were largely responsible for the death of the kittens.

EXPERIMENTS WITH RABIES.

A number of animals reported to have been bitten by rabid dogs were received at the station, and were kept in confinement and under observation.

Several experiments regarding rabies were made in conjunction with the pathological division. One horse which was bitten and some sheep which were inoculated with material from rabid animals succumbed to the affection after showing characteristic symptoms.

OTHER WORK.

Some work was done in connection with the antitoxine experiment to determine the loss in the number of red-blood corpuscles as the result of frequent blood drawings, and the rapidity with which the animal's system is able to correct the loss by the formation of new corpuscles. Time was also given to a study of the character of the newly formed corpuscles, and to the possible modifications in the number and character of the white corpuscles of animals which receive periodic injections of septic material. Investigations along this line will be continued as time will permit.

Animals and facilities were provided the division of zoology for the further investigation of the sheep-scab question, and to test various drugs for the removal of parasites from the stomachs and intestines of sheep and hogs.

The pathological division was provided with animals and facilities for the investigation of the following diseases: Braxy and pseudo-tuberculosis in sheep, vulvitis of cattle, and an infectious disease among the cattle of a local asylum. A number of specimens of black-leg vaccine were also tested for the same division on sheep and guinea pigs.

Cattle and hogs were provided for the biochemic division for special experiments concerning hog diseases, and these animals were treated with material prepared by the division in accordance with instructions accompanying such material.

As in former years, a large number of small animals for experiment purposes were raised at the station and used or forwarded to the laboratories as occasion required.

Several new buildings were constructed, much necessary fencing and refencing was done, and the water system improved and extended. A fairly successful attempt was made to raise a supply of green feed for small experiment and breeding animals. Work of this kind makes excellent returns for the time and thought given to it, and it is to be regretted that the area of ground which is available for cultivation is limited to less than 1 acre.

The need for additional land is constantly and urgently felt. On a total of 20 acres, much of which is occupied by buildings, roadways, outdoor experiment cages and quarantine pens, the following animals, employed in widely different experiments, together with the facilities for handling them and keeping the various infections under proper control, are collected:

(1) A herd of 72 antitoxine animals, consisting of horses, mules, cattle, and donkeys, for supplying hog-cholera, swine-plague, tetanus, and two kinds of tubercular serum.

(2) Several animals, a horse, cattle, and donkeys, for supplying normal serum for a variety of purposes.

(3) A herd of a dozen or more cattle either affected with tuberculosis or being employed in experiments concerning this disease.

(4) A flock of 50 or more sheep, subjects of investigations concerning sheep scab, foot rot, blackleg, pseudo-tuberculosis, true tuberculosis, and various internal animal parasites.

(5) Half a dozen cattle used in Texas-fever investigations.

(6) Cattle on which at least half a dozen different varieties of ticks are being grown, all of which must be kept well separated and under conditions which will prevent the ticks from getting on any animals except those which are intentionally infected.

(7) A small herd of cattle used in tick-dipping experiments.

(8) About a hundred hogs, in special hog-cholera and swine-plague experiments, in which at least a dozen different bacteria, supposedly pathogenic, are being handled.

(9) Dogs in quarantine and under observation for rabies.

(10) Horses affected with maladie du coït.

(11) Goats in special milk work.

(12) Donkeys, hogs, calves, and monkeys, and several kinds of smaller animals in special tuberculosis investigations.

(13) A collection of brood sows, for producing young pigs for special swine-disease investigations.

(14) A number of normal work horses.

Our fields are so small for the animals confined in them that they remain bare of vegetation the entire year and present the appearance of a desert.

DAIRY DIVISION.

A general survey of the condition of the dairy industry of the country at large was begun upon the organization of the dairy division. This has been continued and special inquiries have been made,

such as the status of dairy organizations, dairy schools and facilities for technical instruction, State dairy laws, the development of foreign markets for the dairy products of this country, the milk supply of cities and towns, and laws and ordinances relating thereto. Some reports have been printed and others are in course of preparation.

As heretofore, attention is given to the collection of dairy data in general, with a view to its proper arrangement and future use. So far as the clerical force of the office permits, the material collected has been indexed for ready reference. Although necessarily much in arrears, this catalogue of dairy information is of great value and in constant use.

The routine work of the office is constantly increasing. This embraces current correspondence, with many requests for specific information from all parts of the country, and the preparation of reports and other manuscripts for publication. During the year the division has prepared four distinct publications for distribution, comprising in all 188 printed pages; most of these were liberally illustrated from original photographs obtained for the division or made by its officers. One of these reports was published in the Yearbook for 1900 and two in the current Annual Report of the Bureau, all being separately reprinted.

The chief and assistant chief of the division have visited dairy centers in ten different States and attended conventions of dairy associations and similar bodies in four of these. Rather less has been done along this line than in previous years—first, because of discontinuing the plan of employing persons for this representative service who are not regularly connected with the Department, and, second, because of the time occupied in giving attention to more distant fields of interest.

The new insular possessions of the United States and thirteen foreign countries have been visited during the year by officers or special expert agents of the division. The investigations thus made have embraced the most interesting dairy producing districts of Great Britain and western Europe and the markets of Japan, China, Canada, Cuba, and St. Thomas. Materials have been thus collected for special reports now in preparation and others to be made later.

Experimental exports of dairy products from the United States, similar to those of previous years, have been made to Great Britain, to France (in connection with the Paris Exposition), to Japan, China, Cuba, and Porto Rico. It has been well established that our market for cheese in England and Scotland can be largely and profitably increased by judicious management. Butter from this country can find a place in the British markets at almost any time in successful competition with the best product of other countries, provided our surplus production affords a regular supply and the prices offered become a sufficient inducement to exporters. Occasionally at irregular periods, and owing to special and temporary conditions, American butter can be sold to advantage at Hamburg and at Paris. No other market has developed on the Continent of Europe favorable for butter from the United States. In Cuba, Porto Rico, and other points in the West Indies there are opportunities for increasing the sales of dairy products from this country. A special report upon this subject will soon be submitted. In Japan and China some openings for new trade are being found, but active Australian competition must be met. It is rather too early to express definite opinions on this subject, but

it now appears necessary to raise the quality of Pacific coast products, improve methods of packing and preserving, and obtain more satisfactory ocean transportation facilities before any considerable demand can be created in the Orient for the dairy products of the Pacific States.

Incidental to the experimental exports, fine exhibits of dairy products of the United States were made at the Universal Exposition at Paris and the annual show of the British Dairy Farmers' Association at London (October, 1900). These displays were personally supervised by the chief of the dairy division, and the duties connected therewith required much labor of detail at the office of the division. A report upon the dairy features of the Paris Exposition has already been submitted and published.

During the fiscal year 1901–1902 the work of the dairy division is expected to be largely a continuation of that of the year previous, as above reported.

The investigations of productive conditions, demands of consumption and markets, made in Porto Rico and other West Indian islands by Mr. Pearson, assistant chief of the division, and in the Orient by Mr. Emery, special expert agent, will be completed and reported upon. Further experimental exports are likely to be made, based upon these reports.

Incidental to these endeavors to supply butter and cheese to markets in warm climates, and requiring long voyages without refrigerated transportation, it will probably be found necessary to make a careful study of the whole subject of preparing and packing butter for distant markets and long keeping, with exposures to high temperatures. In the same connection, further investigation of the means of producing good butter having a high melting point and comparatively resistant to high temperature in transit and in market is necessary.

More attention is being given every year in this country to the manufacture of cheese of foreign forms and peculiarities. Information on this subject is called for and another field of labor for the division is thus indicated.

Material improvements are in progress in the milk supply of cities and towns. The dairy division hopes to follow this important subject closely, and to contribute to the means and methods of attaining the desired advance in the purity and quality of market milk.

In accordance with repeated recommendations from this office, approved and embodied in successive Annual Reports of the Bureau and the Department, the Congress at its last session amended the act of 1891, which provides for the inspection of live cattle, the carcasses and products thereof, to include all dairy products offered for export, in order "to secure their identity and make known in the markets of foreign countries to which they may be sent from the United States their purity, quality, and grade." This new law becomes operative with the beginning of the fiscal year of 1901–1902, and it is assumed that considerable work of administration and supervision will devolve upon the dairy division in this connection.

As collateral to the work of this division it is hoped to conduct during the year a very full analytical examination of the various dairy products of foreign countries. Samples for this purpose have already been collected and will be greatly added to from the products found by officers and agents of the division at the foreign exhibitions and markets visited.

Some cooperative labor will be expected of the division in the course of the year under the arrangements already made with the Census Bureau for criticising and verifying the statistics of dairying in the Twelfth Census of the United States.

THE ANGORA GOAT INDUSTRY.

During the last three or four years requests for information about Angora goats have been received in increasing numbers. These requests finally became so numerous that a bulletin was issued on the subject under the title of "Information concerning the Angora goat." This bulletin contains 94 pages, 17 plates, and 1 text figure, and was designed to give answers to all the questions that are asked of the Bureau. But the demand for it was great and stimulated a desire for further information, especially regarding available land and names of breeders and dealers in mohair, subjects which could not properly be discussed in the bulletin. This has operated to increase rather than diminish the correspondence.

Angora goat raising is in fact a rediscovered industry in the United States. For a score or more of years these goats have been raised in large numbers in Texas, New Mexico, California, and Nevada, and there has always been a ready market for their mohair; but it is only quite recently that their ability to clear land of brush, briers, and weeds has become generally known throughout the country. Now that the fact is well known, there has been a great demand for these goats in those sections of the country which are suffering from the encroachment of brush and briers upon the farm and pasture lands. They have found their way into every State in the Union, as well as into Canada and Alaska.

Assured as we are that the Angora will produce an annual fleece which is worth from $1 to $1.50; that it will destroy the brush, briers, and weeds on abandoned land, permitting the grass to follow; that its flesh is as palatable and as nutritious as that of the sheep; that its skin with the fleece attached is worth from $1.50 to $2.50—it would seem that Angora goat raising is certain to develop into a permanent industry.

A Farmers' Bulletin on "The Angora goat" will soon be issued, besides the bulletin mentioned above, and the Bureau will from time to time publish such additional information as may come to hand.

EXHIBIT AT THE PAN-AMERICAN EXPOSITION.

The duty of suitably representing the work of the Bureau of Animal Industry at the Pan-American Exposition at Buffalo May–November, 1901, was intrusted to Mr. E. B. Jones, assistant chief of the inspection division. Although the space and amount of money allotted to the Bureau were both inadequate, a comprehensive display of the various branches of its work was made. The idea was to show, as well as the means permitted, what the Bureau is doing, both scientifically and practically, for the benefit of the farmer, stock raiser, and consumer of animal products.

A list of the various features comprising its exhibit, prepared for the use of the officials of the exposition, gives a condensed description, and is printed here in preference to a more detailed statement. A complete list of the titles of every article shown would be superfluous.

Series 1 illustrates the meat-inspection work of the Bureau.

(*a*) Practical demonstration of the microscopic inspection of pork for trichinæ. Three assistant microscopists are engaged in examining samples of pork from one of the official abattoirs. A specimen of pork containing trichinæ is under a microscope, arranged for the inspection of visitors.
(*b*) Plaster life-size models of a half of a beef carcass, a carcass of mutton, and a hog carcass to show how they are branded after having been inspected and passed as wholesome.
(*c*) Articles used in the inspection of meat and live animals, such as tags, brands, seals, sealing presses, stamps, certificates, sample boxes, compressors, etc.
(*d*) Photographs of the ante-mortem and post-mortem inspection of cattle.

Series 2 illustrates how cattle are inspected and tagged prior to exportation, the manner of loading animals upon the vessels, and the way in which vessels are fitted to secure the safe and comfortable transport of animals to foreign countries.

(*a*) Model of part of stock yards, showing the employees of the Bureau of Animal Industry engaged in inspecting and tagging cattle for export.
(*b*) Model of section of cattle-carrying steamer and pier and stock car. This shows how cattle are loaded from cars into steamer and how they are stowed on board, and the character of the fittings required on vessels engaged in the cattle-carrying trade.
(*c*) Photographs showing the inspection and tagging of cattle for export, the loading of a steamer with cattle and horses, and views of the decks to show the fittings on a modern cattle steamer.

Series 3 illustrates the cause and appearance of the disease known as sheep scab or scabies in sheep, and the spread of which is largely prevented by dipping in a preparation which kills the parasite. The method of dipping is well shown by models and photographs.

(*a*) Models of sheep-dipping plants, showing how sheep are dipped for the prevention of scabies. Two forms of vat are illustrated.
(*b*) Two mounted sheep, illustrating the effects of scabies, one in the early stages of the disease, the other in a more advanced condition.
(*c*) Two wax models, greatly enlarged, of the male and female parasite causing the disease of scabies in sheep.
(*d*) Photographs of sheep-dipping scenes.

Series 4 gives photographs of Angora goats: Views of individuals and groups, pasturage, effect of "goating" on brush land, degrees of fineness in mohair, etc.

Series 5 refers to Texas-fever work.

(*a*) Calfskin, to which are affixed wax models of the Texas-fever tick. This is to show the appearance of the ticks and the way in which they attach themselves to cattle, selecting the more tender and protected parts on the under side of the body.
(*b*) Maps showing the part of the United States infected with Texas or splenetic fever in cattle, one map containing the entire area, others showing sections on a larger scale.

Series 6 is a very complete exhibit of the horse's leg, foot, and shoe—the anatomy of the leg and foot; samples of feet, illustrating various abnormal conditions affecting them; the result of improper shoeing; how to correct abnormalities by using proper methods of shoeing; various kinds of shoes, and horseshoeing tools.

Series 7 illustrates the work of the laboratories of the Bureau of Animal Industry in the investigation of the causes and means of prevention of animal diseases.

(*a*) Working laboratory, fitted with all the necessary apparatus for investigations in pathology, bacteriology, and zoology.
(*b*) Model of chute used for vaccinating calves against blackleg, and also for dehorning them.

Blackleg virus and vaccine.

(*c*) Plaster and wax models of diseased animal organs, to illustrate the lesions found in various diseases.
(*d*) Specimens of tissues and organs in preserving fluid, showing the lesions of different diseases affecting animals.
(*e*) Cultures of pathogenic bacteria.
(*f*) Specimens of animal parasites, preserved in alcohol.
(*g*) Products of bacteria, toxins and antitoxins, mallein and tuberculin.
(*h*) Case of 60 transparent photographs, showing tissues and organs affected with various diseases, magnifications of slide preparations of pathogenic microorganisms, and enlarged views of animal parasites.

Series 8 illustrates the dairy exhibit.

(*a*) Composition of milk and its products; one gallon of milk and its component parts; one tub of butter (10 pounds) and its component parts; one cheese (10 pounds) and its component parts.
(*b*) Samples of the commercial forms of the by-products of the dairy, and articles showing their application.
Casein, albumen, and milk sugar, with their commercial forms and applications, illustrative of the economic uses of the by-products of dairying.
"Nutrium," the nonfatty solids of milk, in a pure, dry, imperishable form, but soluble and digestible, for use as a human food, and especially in baking and bakery products, illustrative of the economic uses of the by-products of dairying.
(*c*) A complete collection of modern cans, models, bottles, buckets, brushes, etc., both domestic and foreign, which are essential to clean dairying.
A large collection of milk cans and dairy hardware, good material and workmanship, with consequent efficiency and durability.
Models and material illustrative of methods and appliances for a pure, sanitary milk supply.
(*d*) General collection of commercial packages for milk and butter, of most approved forms, in use in the United States and foreign countries, showing advancement of the market features of the dairy industry.
(*e*) Collection of 34 models illustrating foreign forms of cheese.
(*f*) Photographs of model dairies.

REPORT OF THE CHIEF OF THE BUREAU OF PLANT INDUSTRY.

U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF PLANT INDUSTRY,
Washington, D. C., September 1, 1901.

SIR: I have the honor to submit herewith a report on the organization and work of the Bureau of Plant Industry for the year 1900–1901.

Respectfully,

B. T. GALLOWAY,
Chief of Bureau.

Hon. JAMES WILSON, *Secretary.*

ORGANIZATION.

With a view to carrying out the general policy outlined in your last Report in regard to the affiliation of allied lines of work, the Office of Plant Industry was organized in accordance with an order issued by you in October last. The bringing together of the related lines of work was accomplished with perfect harmony, and the advantages of the union soon became apparent. As a partial result of this movement it was seen that the time was ripe for a general reorganization of the Department along the lines laid down by you in your last Report, namely, "The aggregation of related branches in such a way as to give the broadest opportunity for the development of all." In accordance, therefore, with your recommendation to Congress, the Bureau of Plant Industry was organized as one of four new Bureaus, and on July 1, 1901, the law authorizing the necessary changes went into effect.

The Bureau as now constituted consists of the following principal offices: Chief of Bureau; vegetable pathological and physiological investigations; botanical investigations and experiments; grass and forage plant investigations; pomological investigations; experimental gardens and grounds; Arlington experimental farm; investigations and experiments in the production of domestic tea; foreign seed and plant introduction; and the Congressional seed distribution. Besides the chief, the other executive officers of the Bureau are Albert F. Woods, in charge of vegetable pathological and physiological investigations and acting chief in the absence of the chief; Frederick V. Coville, in charge of botanical investigations and experiments; F. Lamson-Scribner, in charge of grass and forage plant investigations, and Gustavus B. Brackett, in charge of pomological investigations. To further facilitate the investigations of the Bureau, the several offices have been subdivided, and responsible men have been assigned to direct the details connected with each line of work. Following out this plan, the vegetable pathological and physiological investigations are con-

ducted under Mr. Albert F. Woods by the following officers: Erwin F. Smith, pathologist, in charge of the laboratory of plant pathology; Walter T. Swingle, physiologist, in charge of the laboratory of plant physiology; Herbert J. Webber, physiologist, in charge of the laboratory of plant breeding; Newton B. Pierce, pathologist, in charge of Pacific coast laboratory; Hermann von Schrenk, special agent, in charge of Mississippi Valley laboratory; Peter H. Rolfs, pathologist, in charge of subtropical laboratory; Merton B. Waite, pathologist, diseases of orchard fruits; Mark Alfred Carleton, cerealist; C. O. Townsend, pathologist; George T. Moore, physiologist; B. M. Duggar, physiologist; Rodney H. True, physiologist; William A. Orton, assistant pathologist; Joseph S. Chamberlain, expert in physiological chemistry; Thomas H. Kearney, assistant physiologist; Cornelius F. Shear, assistant pathologist; Flora W. Patterson, mycologist; R. E. B. McKenney.

The botanical investigations and experiments, under Mr. Frederick V. Coville, are in the hands of the following: O. F. Cook, tropical agriculture; A. J. Pieters, pure seed investigation and seed laboratory; V. K. Chesnut, investigations of poisonous plants; Lyster F. Dewey, fiber investigations and assistant botanist; Carl S. Scofield, cereal exports.

The investigation of grasses and forage plants, under Mr. F. Lamson-Scribner, is conducted by A. S. Hitchcock, in charge of field work; David Griffiths, in charge of field management; Elmer D. Merrill, in charge of collections; C. R. Ball, assistant agrostologist.

The Pomologist, Mr. G. B. Brackett, has as his principal officers William A. Taylor, in charge of field investigations; H. P. Gould, in charge of fruit district investigations, and George C. Husmann, in charge of grape investigations.

The work of the experimental gardens and grounds, the Arlington experimental farm, investigations and experiments in the production of domestic tea, foreign seed and plant introduction, and the Congressional seed distribution are conducted by the office of the chief of the Bureau with the following staff: L. C. Corbett, horticulturist; Edwin M. Byrnes, head gardener; George W. Oliver, expert, gardens and grounds and experimental farm; Dr. Charles U. Shepard, tea growing; Ernst A. Bessey, foreign seed and plant introduction; David G. Fairchild, agricultural explorer; Robert J. Whittleton and James Morison, Congressional seed distribution.

In bringing about the organization as here outlined, the fact has been kept constantly in mind that the strongest growth and greatest development can come only through a proper recognition of the necessity for maintaining the integrity of the various related groups. Our policy is to give the broadest opportunity for each branch of work, to unify the various interests, and to bring about a spirit of harmony and friendly rivalry stimulating to all. The results fully justify the statement that nowhere will be found a more united organization and a more earnest desire on the part of each officer to make his work second to none of its kind in the world.

A number of changes have been made in handling the work of certain auxiliary branches of the Bureau which have resulted in advantages to all. Thus, in the case of the experimental gardens and grounds the opportunity is now afforded all branches of the Bureau to have access to the greenhouses and grounds and to utilize to the fullest extent the facilities at hand for carrying on investigations where special facilities are required. The Arlington experimental

farm will also be made not only an auxiliary branch for the Bureau, but as far as possible for the whole Department. As yet the entire work on the farm has been confined to necessary preliminaries, such as clearing, draining, and putting the ground in condition for practical work.

A change has been made in the management of the work of foreign seed and plant introduction. The work is now conducted with a view to making it beneficial to all branches of the Bureau. The plan adopted with respect to this work puts special matters pertaining to seed and plant introduction into the hands of responsible officers already in the Bureau. These officers have been charged with the work of introducing, disseminating, and following up the development of new crops, with, it is believed, the promise of very satisfactory results. The cereal introduction, for example, has been placed in the hands of Messrs. Carleton, Swingle, and Scofield, while the introduction and dissemination of new varieties of cotton will be looked after by Messrs. Webber and Dewey. Mr. Fairchild will be charged with the care of certain special crops, while other members of the Bureau will have similar responsibilities. This plan makes it possible to concentrate work in such a way as to assure the best promise of success. All plans for the future with respect to this work are made with a view of concentrating efforts on furnishing new crops, and following up these efforts until success or failure is assured. The result of this policy is given in detail under another head.

COOPERATIVE WORK.

It has been the general policy of the Bureau to bring about as close cooperation with other branches of the Department and with the State experiment stations as is possible under existing conditions. Fortunately, the past year has brought about changes which make cooperation far more feasible than heretofore. The Bureau is now cooperating with the Bureau of Soils, the Bureau of Forestry, and the Bureau of Chemistry in important lines of investigation. In addition, extensive cooperative work is under way with the State experiment stations, all of which is described elsewhere in this report. True cooperation is always helpful, and our aim has been to recognize as fully as possible the fact that a clear understanding at the outset of what is expected of each party to the work is essential to success.

CHANGES IN PUBLICATIONS.

The growth of the Department during the past few years has led to much confusion in the matter of publications. The number of series of bulletins, circulars, Farmers' Bulletins, etc., has increased so rapidly that it has been difficult to keep track of the various changes made. In order to secure uniformity in the publications of the Bureau as far as possible, plans have been made and put into effect whereby all bulletins by the different branches will be issued as one series. This will greatly simplify matters, and will do away with much of the confusion that now exists. In addition to the one series of bulletins, the Bureau will issue circulars, Farmers' Bulletins, and Yearbook papers. The three last named will be for widespread distribution, and will aim to emphasize the practical phases of all branches of the work.

REPORTS OF EXECUTIVE OFFICERS.

Following are the reports of the several executive officers of the Bureau on the work of their respective branches:

REPORT OF THE PATHOLOGIST AND PHYSIOLOGIST, ALBERT F. WOODS, ON WORK OF THE YEAR.

CEREALS.

The experience of the cerealist in charge of the Department's investigations of cereals, in his trip to Russia and other European countries and in connection with the installation of our exhibit and the jury work at the Paris Exposition, has proved to be very valuable to the Department in its cereal work. A careful survey of the cereal industries of the United States has been made and a report published, in which the problems most needing attention are set forth clearly and concisely. This report has not only proved a very valuable foundation on which to plan our future investigations, but is of great value to those engaged in similar lines of work.

Russian wheats.—The hardy winter wheats imported from Russia have proved so successful that the growers of Kansas have recently imported privately over 15,000 bushels of the Crimean wheat for seed. Still other and hardier Russian wheats are being tested, and will, it is believed, supplant the spring wheats in Iowa, Nebraska, and northern Kansas, and increase the yield in these States probably over 5 bushels per acre. Some valuable drought-resistant Russian wheats which have been tested by the Department show that they are admirably adapted to the region west of the 100th meridian, where wheat growing is uncertain or practically impossible. In connection with the Office of Seed and Plant Introduction we expect to introduce a large number of very promising Russian wheats specially adapted to some of our wheat-growing areas. In all this work disease resistance is kept in mind and some sorts remarkably free from rust have been obtained.

Nonshattering wheats.—A few years ago Jones Winter Fife wheat was tested in Washington State and yielded remarkably well, but the crop could not be saved because of shattering. This variety is therefore being crossed with nonshattering varieties, and the hybrids obtained will undoubtedly produce a nonshattering grain that will yield well in the region in question.

Macaroni wheats.—The tests of the different varieties of macaroni wheats which have been recently made by the Department indicate that several of the finest varieties of these can be produced in the drier portions of the country, from Texas to North Dakota. Notwithstanding the severe drought of the past season, these wheats yielded heavily. The interest that has been aroused in the growing of these wheats and in milling them has been phenomenal, and every endeavor has been made to furnish growers and millers with the necessary information in regard to them. The United States imports annually over $16,000,000 pounds of macaroni, and the establishment of the industry in this country will doubtless lead to the production of thousands of bushels of macaroni wheats on lands where ordinary wheats can not be produced. Efforts to develop foreign and domestic markets are yielding satisfactory results, and it is the belief that we will soon produce better macaroni than that obtained abroad. Our manu-

facturers are rapidly realizing the advantage of using these wheats for macaroni in preference to the ordinary bread wheats, and are now ready to take practically all that can be grown this season. A circular on the subject has been published and a report is now in course of preparation. During the current year a large quantity of these wheats will be imported in connection with the Office of Seed and Plant Introduction, and much attention will be given to establishing the macaroni industry on a firm basis and testing new varieties.

Emmer.—Another crop for semiarid regions to which the Department is calling attention is a food for stock called emmer. This crop is a heavy yielder, and seems to do well where most other crops would perish from drought or cold. A Farmers' Bulletin on the subject is now in press.

DISEASES OF FRUITS.

Bitter rot of apples.—The losses caused by bitter rot in the Middle States often amount to half or three-fourths of the entire fruit crop, single large growers sometimes losing 10,000 barrels of apples. One firm estimated that their losses in 1900 on apples bought in the orchard in Missouri alone amounted to $20,000 to $30,000, and orchards which in midsummer promised a yield of 25,000 barrels of choice apples produced only about 5,000 barrels of indifferent fruit, owing to this disease. The president of the National Apple Shippers' Association estimated that the damage to the apple crop of the United States in 1900 from bitter rot was $10,000,000. These enormous losses have led us to renew our investigations of the disease, and extensive experiments have been inaugurated this season in Virginia, Illinois, and Missouri to test the efficacy of spraying in preventing this disease. The experiments in Virginia, the only ones on which a report has yet been made, appear to be satisfactory. The work is so important that it will be vigorously pushed next season.

Peach rot.—This disease, caused by the fungus Monilia, has been so extremely destructive to the peach orchards of Georgia and Michigan that renewed efforts have been made to find methods of combating it and also to learn more definitely the life history of the fungus. Last summer one grower in the State of Georgia lost his entire crop of 40 carloads of peaches by this disease, and similar losses, representing more or less complete destruction of the crops, were common in the State. In Michigan, too, the losses were very severe, often amounting to one-fourth or one-half of the entire output of whole sections. An extensive spraying experiment was inaugurated in Virginia last spring to test the effect of different mixtures and different dates of spraying both on the peach and the plum, and although this experiment was not as successful as had been anticipated, owing probably to the wet season, the disease was reduced about one-half, and besides some new facts were learned in regard to the life history of the fungus and the resistance of different varieties of fruit. Another important fact brought out is that the rot fungus is distributed by insects—wasps, soldier bugs, and honey bees being prominent in the destructive work. Where the destruction by the rot fungus was extremely severe certain varieties were almost immune, ripening a satisfactory crop alongside of the rotting fruits. The importance of breeding the varieties resistant to the disease will be discussed more in detail under "Plant breeding." While planning these experiments a new device for mixing Bordeaux mixture was invented or perfected.

Black rot of grapes.—In North Carolina and to some extent in adjacent States black rot destroyed the entire crop of Niagara grapes this season and but a very small percentage of the entire crop of grapes matured. A preliminary trip through this region resulted in opening up the question of the efficiency of Bordeaux mixture and the ordinary spraying apparatus in preventing this disease in the South. The coming season a thorough study will be made of the subject to determine why growers in the South fail to control this disease with the treatment which is successful in other parts of the country. Plans have been made for carrying on the work at Southern Pines or Tryon, N. C., or perhaps at both places.

Little peach.—Investigations have been continued on this very obscure disease, and have served to strengthen the evidence of the work last season that the trouble is caused by a minute fungous parasite of the roots. The fungus was found in much larger quantities than ever before, it having increased alarmingly in certain affected localities, and it was also found in fruit for the first time. It does not seem to spread very much to new regions, however. In quite a number of cases orchards affected last year have been totally destroyed the present season. Two methods of dealing with the disease are at least promising—(1) eradication and (2) the securing of resistant stocks. Where growers are on the alert for the disease and promptly pull out and destroy the very first suspected cases their orchards have, almost without exception, remained intact, but where they wait for the trees to ripen fruit and hesitate about prompt removal the disease spreads so rapidly that in three to five years the orchard is practically beyond recovery. As regards resistant stocks, there is but little evidence on this point from our field work, and our conclusion is based entirely on general principles that hold true in the behavior of similar diseases. Although prompt removal indisputably holds the disease in check, we are not satisfied with such a radical line of treatment, and hope by persistent investigation of the life history of the parasite and experiments with resistant stocks to work out some method by which all trees may be saved. An experiment to test the effectiveness of fertilizers and fungicides when applied to soil around the trees will also be made the coming season. Sufficient data on the little peach has been collected to justify the publication of a report at the conclusion of this season's work. While investigating the little peach a number of interesting facts about other peach diseases were gathered and the data will be published during the current year.

Pear blight.—Pear blight has broken out with renewed severity in Texas, and has been extremely destructive to the Bartlett pears growing on the Pacific coast. (See "Work on the Pacific coast.") A visit to Texas in October is planned to test our method of eradicating the disease by cutting out the hold-over blight. The experiment will be continued during next spring.

ROOT ROT OF FRUIT AND OTHER TREES.

The special agent in charge of the Mississippi Valley laboratory has made very satisfactory progress in the study of the root rot of fruit and other trees, a disease which causes immense losses in all the great fruit-growing regions. The parasite which causes it has been found and its life history has been partially worked out. Extensive experiments

have been started, in cooperation with a number of nurserymen, to test the resistance of different stocks to the disease, and a large number of stocks have been obtained for this purpose from Australia and other sources. The results so far obtained give ground for the hope that a method of controlling the disease will soon be worked out, and a special endeavor to do this will be made the coming season.

DISEASES OF FOREST TREES AND CONSTRUCTION TIMBER.

The great revival of interest in forestry and the care of trees has made it desirable that our efforts to furnish information as to the best methods of controlling or preventing some of the most serious diseases of trees be increased. The main results of the year's work were published in two bulletins, one on diseases of the red cedar and one on diseases of New England conifers, and also in a Yearbook paper on general diseases of forest trees, all of which elicited very favorable comment, and for which there has been a great demand. The great annual losses of life and property resulting from the destruction of construction timber by fungi is a matter of much importance, and various tests are under way to determine the best methods of preventing these losses. The expert in charge of these investigations has been sent to Europe to study the methods in vogue there for controlling forest-tree diseases and treating construction timber to prevent the development of rots. The Bureau of Forestry is actively cooperating in the work, and the matter is of such great moment that many railroad and other interests have urged the necessity of enlarging the investigations and have given us material assistance by practical cooperation. The work on all diseases of forest and shade trees and construction timber will be pushed vigorously the current year, and with its development there is every reason to believe that there will be a corresponding decrease in the loss of life and property. A special fund will be required for this important work.

DISEASES OF COTTON.

A great deal of work has been done in connection with the diseases of cotton during the year. It has been found that the wilt disease is much more widespread and destructive than was hitherto suspected, and that the annual losses from it far exceed our former estimate of $250,000. It is especially destructive in Alabama and Mississippi and in the sea island cotton districts of Georgia and Florida. As a result of the work, it is believed that a practical remedy, or rather preventive, has been found through the selection of seed from healthy or resistant plants growing in infected areas. We have a considerable number of such resistant selections growing, and these will be greatly increased next year. The subject is further discussed under "Plant breeding." A careful study of the root rot of cotton, so prevalent in all Southwestern cotton areas, has been undertaken, and also a study of boll drop, anthracnose, and other serious diseases of the crop. The work will be continued and enlarged the coming season.

WORK ON TOBACCO.

The investigations of tobacco discussed in the former annual report, and carried on in cooperation with the Bureau of Soils, were temporarily suspended, owing to the fact that the expert who was conduct-

ing the work resigned early in the year to accept a more remunerative position in Japan, as stated in our last report. His final work here resulted in the discovery of a new enzym, and a report on this was published, this being his third report on the investigations. The work will now be resumed, two experts having been appointed to carry it on, in cooperation with the Bureau of Soils. It is expected that many valuable facts will be brought out during the current year. The so-called mosaic disease of tobacco was worked out during the year, and a paper in regard to it is now ready for publication. The breeding of new strains of tobacco is discussed under "Plant breeding."

TRUCK AND GARDEN CROPS.

Spraying experiments were carried on during the past year with a view to controlling the tomato blight mentioned in the last annual report and were successful, the work showing that the disease, which causes large annual losses, can be easily and economically controlled. Laboratory investigations of the wilt disease of the cowpea and watermelon were continued. As the former is one of the most important rotation crops of the cotton and truck areas, it is very desirable that we determine whether the method of selection which promises success in controlling the cotton wilt may not also be effective for wilt of this and other crops. The results so far obtained are very encouraging. A similar wilt of cabbage, which is very widespread throughout the South and very injurious, has been studied, and we will probably soon be able to recommend methods of preventing it. A great many diseases of other truck and garden crops have been called to our attention, and it is planned to work out remedies for these also the coming season.

During the year we collected from all parts of the country and from Porto Rico a large number of varieties of sweet potatoes, for the purpose of determining the comparative merits as regards adaptability for shipping, disease resistance, productiveness, etc. Duplicate experiments with the collection are being carried on at College Park, Md., and Tarboro, N. C., in cooperation with the agricultural experiment station and the State Board of Agriculture, respectively. The experiments will be continued and enlarged the coming season, and will include a study of storage and other questions connected with this crop.

GREENHOUSE CROPS.

During the year our investigation of carnations, lilies, violets, and other greenhouse crops has been continued in cooperation with other branches of the Department, watering, feeding, and propagation receiving careful attention. Much valuable information on these subjects has been collected, and it is hoped to bring this together in the form of a bulletin at an early date. The work along these lines will be continued and enlarged. Plans have already been made for carrying on a special study of diseases of the rose.

DISEASES OF THE SUGAR BEET.

The serious sugar beet blight which causes severe losses in California and Colorado, as mentioned in the previous annual report, has appeared to some extent in Nebraska the present season. The results

of the investigations in California, Colorado, Kansas, and Iowa indicate that this particular blight is not of parasitic origin, but that it is due to a lack of sufficient moisture to meet the demands of excessive evaporation from the foliage. Beets affected with this disease become hard and woody and the young feeding roots and taproot are destroyed. An expert pathologist has been appointed to carry on investigations of the diseases of the sugar beet, and his entire time will be devoted to this work during the next two or three years. We are in constant receipt of requests for information in regard to these diseases from all important beet-growing regions. A report on the particular blight above mentioned will be published during the current year.

WORK IN THE PACIFIC COAST STATES.

Bacteriosis of walnuts.—Three lines of work on this disease have been carried on during the year: (1) Extensive spraying experiments for the purpose of preventing the disease in orchards already established. Some of the sprays tested resulted in a large saving of nuts, while others gave no positive results. (2) Selecting from seedling orchards resistant trees, which embody the character of fruit and habit of growth most desired, and from which nursery stock may be budded or grafted. One variety has been found which answers these requirements and others will certainly be obtained when the field can be thoroughly explored. (3) Breeding of resistant varieties, which includes the crossing of hardy varieties of *Juglans regia* and hybridizing this with other species of Juglans which appear to be free from the disease. Considerable work in this line has already been done, and as a practical result a hybrid root has been found which has such great hardiness, notwithstanding unfavorable soil conditions, that it will be used as a stock upon which to graft the disease-resisting varieties of *Juglans regia* when selected from the orchards. Its vigor and hardiness are such that it bids fair to increase threefold the possible successful commercial walnut culture of the Pacific coast, and will eventually represent a great financial gain to the industry. The work on bacteriosis will be continued on the lines above mentioned, and a large amount of field work will be necessary in the treatment of groves, the study of the comparative resistance of trees, the crossing and hybridizing of tens of thousands of nuts, the propagation of trees from the nuts obtained from the work of the past spring, the testing and grafting of stocks, etc. This growing and grafting of stocks and hybrids calls for land, and it is hoped that this requirement may be met in some satisfactory way. During the year we hope to make a collection of nuts of all species of Juglans and of all well-marked types of *Juglans regia*, so that a direct comparison may be made of the varieties, and that the different wild species may be on hand for the hybridizations planned.

Pear blight.—This bacterial disease of pomaceous fruits has now become well established in many parts of California and the North Pacific States. It has been found that the infection of fall bloom and the tender growth at the base of the main limbs has resulted in the death of more trees in California than is caused by the common spring infection. By preventing such bloom and growth from developing at the base of the main limbs, where it is not required for the production of fruit, a leading source of the infection of the more vital parts of the tree is removed. As the disease is prevalent in orchards where colonies of bees are kept in the vicinity, it has been

agreed by owners of large colonies to remove them to a distance of 5 miles from the orchards during the season of bloom, which in California is largely synchronous with the season of growth. This experiment, which will be made the coming season, should supply data for future action, and in order to collect it records of several orchards will be made in a comparative way to show the number of infections before and after the removal of the bees. This work will have to be done on a large scale and continued through several years. It is also proposed to shortly determine the identity or nonidentity of pear blight and the new blight of the loquat, the bacterial nature of the latter being already known.

Tuberculosis of the olive.—This destructive disease has been studied in both the field and the laboratory during the past year, and the work has led to the conclusion that the disease may be practically controlled in the State, and that naturally resistant varieties of olives may be found. It is proposed to conduct spraying experiments for the control of this disease the current year, and as soon as suitable quarters for infection experiments are secured it is also proposed to test the comparative resistance of different varieties of olives to the disease and to study the action of germicides. A specially constructed hothouse, so planned that it can be easily disinfected, will be necessary for this work.

Diseases of the vine.—A serious disease of vines, which is now destroying thousands of acres of vineyards in the Santa Clara Valley, has been studied, and the field work has resulted in the selection of a resistant root. These facts have already been given to the vineyardists through the California press, and will probably enable the vine growers to reset their vineyards with ultimate success. There are many reasons for believing that this root will save the vineyards of southern California from the ravages of the California vine disease, and numerous vine growers are already preparing to test it on a scale commensurate with the heavy interests involved. Should these tests prove that the root is able to successfully support a tender top in the affected district one of the most obscure and destructive vine diseases known will be overcome in a simple and practical manner. Hundreds of acres of vines are also being grafted in the Sacramento Valley upon roots of vines found to be resistant in southern California to the disease in question. These extensive experiments are being directed and followed with interest. The coming season the testing of vine roots supposed to be resistant to the California vine disease will be greatly extended and the work on the vine trouble in the Santa Clara Valley will be continued.

A new raisin and table grape of fine quality, the result of crossing the Muscatel with the Almeria, is also being tested in the district in southern California where the California vine disease is prevalent. Thus far, it is growing finely, with no evidence of disease, but too little time has elapsed since planting to admit of any proper estimate of its hardiness. The testing of this grape will be continued in southern California.

Blight of sugar beets.—A thorough field study and careful laboratory investigations of a so-called beet blight, which caused heavy losses and considerable alarm in California during the season of 1900, have been carried on. The results obtained from the work have been against the opinion that the trouble is of a parasitic nature, but sup-

port the view that it is due to insufficient moisture in the subsoil at some time during the growing season. A brief report on the trouble was made, in which the main conclusions reached were given, together with recommendations which it is believed will lead to the overcoming of the blight and be of material advantage to the industry. The fact that the blight has disappeared with the past winter's normal rainfall is in harmony with the above conclusions. So far as may be necessary the study of the disease will be continued.

Miscellaneous.—Considerable data relative to black canker of the apple in Oregon and Washington have been collected, and if sufficient assistance can be provided and time permits, an extensive series of spraying tests to control the disease will be undertaken the coming season. In addition to the canker, a large number of minor diseases have been studied during the year, among them being a bacterial disease of loquats, which, as before mentioned, is perhaps pear blight. Besides the scientific work conducted at the Pacific coast laboratory, a large correspondence is carried on, and through this channel the influence of the work is materially extended.

WORK IN THE MISSISSIPPI VALLEY.

This work has so increased that it has been found desirable to establish at St. Louis what is known as the Mississippi Valley laboratory. Through the cooperation of the Shaw School of Botany and the Missouri Botanical Garden our work at this laboratory is greatly facilitated. The assistant in charge is vigorously prosecuting work on the special problems pertaining to the Mississippi Valley and also on diseases of forest trees and construction timber and the root rot of fruit trees. During the early part of the past year he made an extensive trip through California and the West studying the diseases of trees, collected and prepared for the Pan-American Exposition one of the finest exhibits of specimens of diseased wood ever made. He also prepared and published two bulletins and a Yearbook paper on diseases of trees, and inaugurated some extensive experiments in Missouri and Illinois for the purpose of working out a remedy for root rot and bitter rot. (See "Diseases of fruit" and "Root rot of fruit and other trees.")

WORK AT THE TROPICAL LABORATORY.

The large amount of information which we are called upon to supply relative to diseases and culture of tropical crops has made it necessary to establish the tropical laboratory in connection with the tropical garden maintained at Miami, as set forth in previous reports. An expert pathologist has been placed in charge of this laboratory, and the work is being pushed vigorously. Many new introductions have been set out in the garden during the year, and are being tested to determine their freedom from injurious diseases and for the purpose of propagating them for distribution to the State experiment stations and to others in the regions to which they are adapted. The hybrids being tested here will be discussed further under "Plant breeding." In addition to the work now being carried on, the laboratory will take up the study of diseases of truck crops for Northern markets, and will resume the work on citrous and other subtropical fruits, which was dropped on account of the destruction of such trees by the great freezes a few years ago.

PLANT LIFE HISTORY.

Studies of the life histories of the principal crop plants are being carried on to determine the exact environmental conditions necessary to each stage of growth, and although the researches in this line are still in their infancy, they have already yielded results of the highest importance to agriculture. The work consists in a thorough investigation of the exact requirements of climate and soil necessary to successful growth and profitable production, and is similar to that done on the date palm and set forth in the last Yearbook. It was not known why the date palm was unfruitful in Florida and in parts of California until our work demonstrated that a certain maximum amount of heat is necessary to the production and maturation of fruit. As a result of our studies in connection with this plant the areas where it will thrive have been mapped, and include large tracts that are now desert lands. It is known that much of the alkali desert land in Arizona and in that general region can be reclaimed at comparatively slight expense by establishing a rotation of alkali-resistant and heat-loving crops, with the date palm as a basis, as has been done in the oases of the Sahara Desert. Similar studies are in progress in connection with other crops and with the microscopic nitrogen gatherers of the soil, especially those that develop in connection with the clovers and other Leguminosæ. Other nitrogen-fixing microorganisms that give great promise of economic importance have been discovered. This work will receive special attention the current year.

Fixation of atmospheric nitrogen.—Special attention is being given to the whole subject of assimilation of atmospheric nitrogen by bacteria and other microorganisms, and in this connection a careful study is being made of the life history of the bacteria which inhabit the root tubercles of leguminous plants, and also of the plants themselves, with a view of finding a means of favoring the process and of better utilizing the nitrogenous matter thus formed in agricultural practices. Pure cultures have been made of many of the principal races of these bacteria, and we are endeavoring to find forms specially adapted to particular conditions of soil and climate. Such cultures, when obtained, are to be distributed to the experiment stations for use in artificial inoculation of soils on which new leguminous crops are grown. It is often the case that the most effective bacteria are wanting on soils on which such crops are being grown for the first time, and consequently no fixation of atmospheric nitrogen results unless the proper bacteria are introduced along with the new crop.

The life histories of the principal leguminous plants are being worked out, as before stated, in order to determine exactly the regions to which they are best adapted, so that the best system of crop rotations can be arranged and the best nitrogen-fixing plants for the various regions determined. It is our intention to give particular attention to the finding of new leguminous crops which will fix nitrogen abundantly for regions now lacking such plants or very poorly supplied, and we hope through this work to reduce the outlay necessary for the purchase of the very expensive nitrogenous manures and prevent deterioration of soils where no manure is applied. Comparative studies of the physiological and chemical action of the principal nitrogenous manures in comparison with the effects induced by preceding leguminous crops are also contemplated. Besides the bacteria above discussed, studies are being made of other soil bacteria which fix

atmospheric nitrogen, in the hope of finding a way of accelerating the beneficial action of species that do not require a symbiotic relation with the roots of higher plants. Nonleguminous plants will also be studied to find if possible some having root tubercles that will fix larger quantities of nitrogen or which are adapted to soil and climatic conditions unfavorable to leguminous plants. Other soil organisms which may aid or hinder the fixation of nitrogen are also receiving attention. It is hoped that by means of these studies the cost of nitrogen will be appreciably cheapened, and that a comprehensive knowledge will be gained in regard to sources of obtaining it, etc. A special fund will also be required for this important branch of our work.

PLANT NUTRITION.

For several years special attention has been given to plant nutrition in relation to the health of plants and their productiveness. It is not necessary to summarize the work already done along this line, but it may be said that during the past year we have completed preliminary investigations on the relation of lime and magnesia to plant growth and called attention to the fact that liming of soils is of much greater importance than has been heretofore realized. A report on this subject is now in press. A special investigation has also been carried on in regard to the relation of alkalis to plant growth, and observations of great practical importance have been made, especially in reference to the action of gypsum in diminishing the injurious action of magnesium and other salts which occur in alkali soils. It has been found that plants may support over one hundred and twenty-five times as much magnesium with a supply of gypsum as they can without it. A report of the work on the relation of alkali to plant growth has been prepared in connection with the Bureau of Soils, which is cooperating in this phase of the work, and is now going through the press. Another important phase of the work is the securing of alkali-resistant crops, and already we have obtained some valuable strains of alfalfa which will grow in soils having a higher percentage of alkali than any on which this crop has hitherto thrived. This will be discussed further under "Plant breeding," and will receive special attention during the current year.

PLANT BREEDING.

There is a constantly increasing interest in the subject of plant breeding, partially as a result of the work undertaken by the Department, and now many of the experiment stations and some private individuals and firms are engaging more actively in work of this nature. The results which have been obtained in our work in this line are in many cases far-reaching and of almost incalculable value. Owing to the fact that the obtaining of valuable variations requires considerable skill and is precarious and costly, private individuals are generally deterred from undertaking such work, hence it is very desirable that it should be pushed under the direction of the Government, particularly in cases where the work must be carried through a number of years to obtain definite results. The plants to which we have been giving special attention from the standpoint of breeding are those of the greatest agricultural value, but the limited amount of money at our disposal has greatly restricted the work under way and has prevented our taking up to any extent the improvement of

other crops, such as alkali-resistant plants, tobacco, rice, and certain vegetables.

Cotton.—The work in breeding cotton was started on a small scale in the fall of 1899, when a few crosses were made between improved strains of sea island and a black, smooth-seeded upland cotton, in the hope of producing a long-staple upland race. This work has been continued and greatly extended, and many new lines of investigation have been taken up. The production of races of upland cotton yielding a fiber from 1¼ to 1⅜ inches in length is of the highest importance. Cotton of this grade is worth from 15 to 20 cents per pound, and there is a constant demand for it. New mills for the manufacture of such a staple into fine yarn, underclothing, thread, etc., are continually being erected in New England and the South, but the fiber now used by them is largely imported. Several long-staple upland cottons which produce fiber of this grade already exist, but on account of their tufted seed they can not be readily ginned on a roller gin, which is practically necessary to avoid the tearing and breaking of the fiber. Sea island cotton grown in the interior of Georgia and Florida practically meets the demands, but this cotton is so unproductive and difficult to pick that it is far from satisfactory. Again, the regions suited to the production of sea island cotton, so far as is now known, are of limited extent. What is urgently required is a variety with fine, strong lint, from 1¼ to 1⅜ inches long, and with big bolls, like the upland cotton, which open up well and are easy to pick. Such a variety to be successful must be more productive than sea island cotton on ordinary upland cotton soils. Several select hybrids have been produced in the course of the experiments and bid fair to meet the demand successfully if they can be bred into stable races. It will require several years of selection before these are sufficiently stable to put into the hands of growers, but it is believed that the most difficult step has already been taken. Several cotton experts who have examined these hybrids pronounce them excellent and most promising productions. They are the best of several thousand hand-bred hybrids of known parentage.

Considerable attention has been given, in cooperation with the Office of Seed and Plant Introduction, to establishing the growing of Egyptian cotton as an industry in this country, and preliminary trials in several locations have proved very satisfactory. A number of Egyptian varieties have been tested from the standpoint of breeding, but the results obtained were unsatisfactory, mainly because of unproductiveness. Last year experiments were started in the selection of different varieties of Egyptian cotton to increase productiveness, and some of the selections grown the present year are very promising. Patches of variety selections of Egyptian cotton from imported seed are being cultivated in South Carolina, Georgia, Florida, Mississippi, and Texas, and the results already obtained show almost conclusively that by a few years of careful selection the growing of Egyptian cotton in this country can be established on a paying basis.

Another important line of cotton breeding is the increasing and improving of the quality of the fiber of our standard races of upland cotton. During the present season experiments for the improvement of several of our best races were inaugurated, and it is confidently believed that the work can not fail to yield valuable results in a few years.

One of the most important phases of cotton breeding is the produc-

tion of disease-resistant strains. Experiments have shown that selected seed from plants which resist the wilt disease transmit their immunity in a wonderful degree, and it thus becomes feasible to control the disease by the easy and inexpensive method of breeding resistant varieties by selection. Our experiments have also shown that certain varieties, such as Jackson and some of the Egyptian cottons, are already largely immune to the wilt. Our work in this line was greatly extended the present season, but unfortunately was seriously checked by the cold, damp weather immediately following the planting. Under favorable conditions, we should have had seed of resistant strains to distribute for next year's planting.

Certain other diseases of cotton, such as the Texas root rot and anthracnose, may also probably be successfully controlled by breeding resistant strains, and experiments with this end in view have already been started.

The most important feature of the future work in the breeding of cotton is to fix into stable races some of the fine hybrids already secured. This will necessitate their being cultivated in isolated patches, away from other cotton fields, and selected until they become true to the type desired. Meanwhile the quantity of seed will be increased, so that by the time the race has been bred true to type we will have a sufficient amount of seed for distribution.

The Egyptian cotton selections which have proved productive will also be grown in isolated patches next year and further selections made. The breeding of strains of cotton resistant to wilt, root rot, etc., is of the greatest importance, and will be vigorously prosecuted on the lines already started.

Corn.—The breeding work on corn started several years ago has been continued and new lines of improvement have been inaugurated. This work is being carried on mainly at Washington and at Lincoln, Nebr., but patches of special productions are being grown in New York and Michigan. The severe drought in the West this year seriously injured our experiment at Lincoln, but it brought out some interesting facts as to drought resistance in the hybrids being tested.

Corn is used very extensively in the preparation of hominy for human food, but the sorts now most generally employed for that purpose are not particularly suitable. The flint races, which are the best for hominy, are not sufficiently productive for the farmer to grow them unless a better price could be obtained than for the ordinary dent corn, and this is not commonly the case. It is of the highest importance that sorts be secured which are richer in protein and nitrogen than the ordinary sorts, and it is believed this can be done by breeding, some of the hybrids produced in this way being very promising as special hominy varieties.

As in the case of cotton, it is believed that valuable results can be obtained by the rigid systematic selection of the best races of corn now grown with a view of securing increased yield and fixity of type. Experiments with this in view have been started in Ohio and will be continued next year. We have already secured from our experiments several hybrids which give promise of being early sorts. These are being grown the present season in New York and Michigan. The Peruvian or Cuzco, which is famous for producing the largest kernels of any variety grown, has been used extensively in our hybridization experiments with standard races of dent corn, but thus far the results have not been promising, the hybrids, though frequently vigorous,

being largely sterile, and in no case sufficiently productive to be valuable.

The coming year the promising hybrids that have been secured will be grown, tested, and selected in the regions for which they are thought to be best adapted. The work on the production of a prolific hominy variety, which promises to yield valuable results soon, will be vigorously pushed, and it is believed that one or two years' selection of some of the sorts in isolated patches will justify their distribution for more extensive trial by farmers. The production of races richer in nitrogen requires careful chemical work, and it is planned to make arrangements to have this feature of the work taken up the present year. As demonstrated by the Illinois and Kansas experiment stations, the gross character of the kernel indicates what may be expected, and attention has been given, as far as possible, to these characteristics in all our work up to the present time.

Wheat.—During the year breeding experiments with wheat have been carried on at Halstead, Kans., the heart of the wheat belt, and in Ellis County in that State, with a view of developing drought-resistant and hardy wheats, many of the best Russian wheats being used as a basis for the production of the latter feature. In addition to the crosses already made, about 300 varieties of Russian wheats and about 200 varieties of macaroni wheats were tested. A great deal of cooperative work in this line has been taken up with the experiment stations in different wheat-growing States, and extensive experiments are now under way at the Texas, Kansas, South Dakota, Minnesota, and Maryland stations. In the experiment at the Minnesota station special attention is being given to the breeding of wheats that will yield a higher percentage of nitrogen, and some very promising results in other directions also have already been obtained. During the coming season experiments on a large scale will be made for the purpose of producing varieties of greater nutritive value, disease and drought resistant, and hardier and better yielding than the present varieties.

Alkali-resistant plants.—Probably with no crops does breeding promise more valuable and far-reaching results than with those which might be grown on alkali soils. On such soils the great mass of plants finally die, but here and there some seem to withstand the injurious effects of alkali and mature successfully, and from this fact it is inferred that by careful selection from such plants for several years new strains resistant to alkali will be obtained. The Bureau of Soils has demonstrated that ordinary alfalfa will not grow successfully in a soil containing six-tenths of 1 per cent of alkali, but one of the agricultural explorers of the Bureau of Plant Industry discovered an Algerian alfalfa growing normally in a soil containing 4 per cent of alkali. Again, Algerian agriculturists have bred varieties of grapes which not only grow on alkali soils where ordinary varieties succumb, but do not take up the alkali in sufficient quantity to injure the wine made from them, and French vineyardists have bred varieties which will grow successfully on strong lime soils. In laboratory cultures of lupines with alkaline mixtures of various strengths, very great differences have been observed in the ability of different individuals to withstand injury from alkali. These facts justify the belief that by a systematic course of selection alkali-resistant strains of some of our agricultural crops can be secured, and during the present season an assistant has been giving especial attention to this problem and has started alkali-resistant selections with wheat, barley, and alfalfa.

Some difficulty is experienced in determining truly resistant plants, as the percentage of alkali in the soil may differ materially within a distance of a few feet, and a plant apparently resistant may owe its success to a lower percentage of alkali in the soil under it and not to any inherent resistance. Before a plant is finally selected for breeding purposes, therefore, it is necessary to make a careful test of the soil immediately beneath it.

Crossbreeding such resistant plants with resistant varieties imported from other countries also furnishes an important field for experiment. The results already obtained are very encouraging, and if the necessary funds are provided the work will be extended and vigorously prosecuted. The work will include the selection of seed from resistant plants, the growing and testing of such seed, the crossbreeding of resistant strains, the selection and adaptation of imported resistant strains, etc. The work is of the greatest importance and should receive commensurate attention.

The orange.—The work of breeding a hardy orange by crossing the hardy Japanese trifoliate with the different varieties of the ordinary sweet orange has not yet reached a final conclusion. It was thought that some of the trees would fruit this year, but they have not done so, owing probably to the fact that the bud wood was taken from the hybrid seedlings while very young. Budded trees of each of the hybrids have been distributed to various experiment stations in the Southern States to be grown and tested and also to furnish bud wood for distribution of any sorts that may prove valuable. Several of the hybrids having trifoliate leaves like the trifoliate orange parent, but much larger, are of evergreen habit, and have shown themselves quite hardy. Should these produce good fruit, they will be sufficiently hardy to endure the cold of ordinary winters in the Gulf States. As stated in the previous report, some of these hybrids will make valuable hedge plants and will be of great value for this purpose alone. The hybrids which fruit will be carefully tested and studied and those which prove promising will be propagated as rapidly as possible to secure buds for distribution should the results of a second year's fruiting show the fruit to hold up. The value of a variety can be determined only after several years' growth under a wide range of conditions, and only the growing of a variety on a commercial scale would furnish such a test. Of course, it is manifestly impossible for the Department to make such a test; but if after two years' fruiting a sort seems valuable it will be grown and distributed.

Grape fruit and tangerines.—The hybrids of different varieties of grape fruit and tangerines, made particularly to obtain new fruits of better or distinct quality, will fruit this fall for the first time, and it is confidently expected that some of them will show improvements of value.

Grapes.—All breeding work done with grapes was carried on by the assistant in charge of the Pacific coast laboratory, and is discussed under the heading of "Work on the Pacific coast."

The pear, apple, and peach.—During the year quite a large series of hand pollinations were made with the Kieffer pear in the vicinity of Washington, D. C., in order to get more exact knowledge about this important commercial variety and also to secure new hybrids between the Kieffer and choice dessert pears, such as Seckel, Anjou, Mannings, etc. A fine lot of cross-pollinated Kieffers has resulted from the sea-

son's work, and these should produce at least two or three thousand seedlings, from which we hope to obtain pears having the quality of the Bartlett and Seckel and the disease resistance of the Kieffer. Several hundred fine seedling hybrids are now growing on the Department grounds as a result of our work in this line. We hope to continue the work each year until an entirely new race of pears, which will cover all seasons of the year, is obtained. Similar work will also be carried on with the apple. As stated under "Diseases of fruit," some peaches seem immune from rot in orchards where the disease is very destructive. It is hoped to undertake experiments in breeding varieties which will resist this disease.

Pineapples.—A number of pineapple hybrids produced by crossing and now growing in Florida have fruited this year for the first time. The proportion of valuable hybrids in this collection is remarkable, and the fruit is excellent. The extent of variation shown is remarkable, no two being alike. The production of smooth-leaved varieties was one of the main objects of the crossing, and some of the best of the hybrids have smooth leaves. The valuable hybrids will be propagated as rapidly as possible and tested more thoroughly, but it will require several years to secure sufficient stock to enable us to distribute plants to growers. A number of the hybrids have not yet fruited and it is probable that other valuable sorts may be secured from these. As the pineapple is one of the most important fruits in our new possessions and its commercial importance to Florida is second only to the orange, the production of improved varieties is of considerable moment, and work with it will be extended and vigorously prosecuted.

Miscellaneous fruits.—Some work has been started on other fruit crops which are not of so great importance commercially. In the case of the guava, which is one of the most important household fruits of the Tropics and subtropics, many selections have been made of plants producing very few seeds. A number of seedlings of these are being grown, with the hope of securing varieties with fewer seeds than any now known. The guava is capable of great development and should be carefully bred. Work is also being carried on with the strawberry in the hope of producing late varieties, and this will be continued the coming season.

Principles of breeding.—In connection with the practical work in progress, a careful scientific study is being made of the principles underlying breeding. While many fundamental principles are well understood, some of them are still quite obscure, as, for instance, the effect of environment on plants, which is so important and the knowledge of which is so meager that it can not be intelligently utilized. Experiments for the purpose of obtaining light on this factor have been arranged with several of the experiment stations. The prepotency of pollen and preponderance of one species over another in hybridization are not understood with any degree of accuracy and are being investigated. The immediate effect of pollen, until recently a botanical enigma, has finally been cleared up and is now thoroughly understood, the work which we have carried on having had much to do with its final solution. The problems of heredity, which are among the most obscure and important of biological questions with which the scientist has to deal, bear closely on the work of the practical breeder, and studies looking to a clearer understanding of the laws governing these will be prosecuted as rapidly as possible.

HERBARIUM.

In the examination of diseased plants sent in from all parts of the world it is necessary to identify the parasitic fungi associated with the various diseases, and in this work the herbarium is indispensable. Our collections of economic fungi have been largely increased during the past year, as have also our facilities in the way of card catalogues, etc. The amount of work involved in connection with the herbarium has made it necessary to appoint another assistant. The demand for the identification of edible and poisonous fungi is so great that this work occupies almost the entire time of one expert, at least during the season for such fungi. Sets of duplicate specimens have been carefully named and have been prepared for distribution to the experiment stations, but owing to lack of assistance we have been unable so far to send them out. It is hoped that this work can be attended to during the current fiscal year, as we have many requests for sets on file.

ADMINISTRATIVE WORK.

The correspondence of the office is rather heavy, amounting during the year past to probably not less than 10,000 letters, exclusive of circulars. We believe this to be one of the best channels through which to impart the information and assistance that should be furnished to those for whose interests the work is being carried on, and careful attention is given to all communications. The number of diseased plants sent to us for examination and report is very large, and requires much of the time of two expert pathologists.

During the year we have issued 7 bulletins, 1 report, 1 circular, and 3 Yearbook papers. The subjects discussed in these publications are, respectively, zenia, or the immediate effect of pollen in maize; spot disease of the violet; the basis for the improvement of American wheats; some diseases of New England conifers; Wakker's hyacinth germ; the wilt disease of cotton and its control; the cultural characters of *Pseudomonas hyacinthii*, *P. campestris*, *P. phaseoli*, and *P. stewarti;* catalase, a new enzym of general occurrence; a new wheat for the semiarid West; fungous diseases of forest trees; commercial pear culture; and successful wheat growing in semiarid districts. In addition to these, we have prepared and have now in press 3 bulletins, 1 report, and 2 Farmers' Bulletins, which treat, respectively, of plant breeding; the relation of lime and magnesia to plant growth; spermatogenesis and fecundation of Zamia; some mutual relations between alkali soils and vegetation; emmer, a grain for the semiarid regions; and pineapple growing.

As stated under different headings, we have on hand a large collection of data on different subjects, and during the year we hope to issue publications on macaroni wheat; bitter rot of the apple; diseases of the peach; cotton; the mosaic disease of tobacco; diseases of the sugar beet; black canker of the apple; corn breeding; corn selection, etc.

As heretofore, a number of lectures have been delivered by members of the force before scientific societies, horticultural associations, farmers' clubs, etc. Although this requires considerable of the time of the experts, it brings our men into close touch with the practical men outside and affords the best opportunities for bringing together the practical and the scientific. Our workers have been much benefited by such experience, and the appreciation of such lectures by organizations has been repeatedly expressed.

THE PAN-AMERICAN EXPOSITION.

The remarkable success of our exhibit at the Paris Exposition made it seem desirable to reproduce certain features at the Pan-American Exposition at Buffalo, among these being exhibits showing the cereals for milling and transportation, new varieties of cereals produced in the United States, etc. A new feature of the exhibit is a large collection of wood, showing the parasites causing the decay of construction timber and forest and shade trees. The wood was carefully prepared, and the parasites causing the decay are in most cases clearly shown. This exhibit is designed to give those interested a clear idea of what investigations the Department is carrying on in this line. Another portion of the exhibit illustrates the methods of treating the most injurious plant diseases. This has proved to be a very popular feature. The plant-breeding work of the Department is also represented by photographs and specimens, the subject being presented in such a way as to convey a good general idea of the work being done.

REPORT OF THE BOTANIST, FREDERICK V. COVILLE, ON WORK OF THE YEAR.

SEED-TESTING WORK.

During the year ended June 30, 1901, more samples of clover and grass seeds have been sent in by seedsmen and farmers for testing than ever before. In a number of cases seedsmen have sent samples for examination and have depended upon our report to guide them in the purchase of large quantities of seed. We intend to encourage this practice and to be in a position to furnish prompt and accurate information in such cases. We also hope to inaugurate a system by which seedsmen may guarantee a standard grade of field seeds. With this in view, we are now training additional help to do the careful mechanical work required.

DEPARTMENTAL TESTS.

Some 400 samples of grass seed were tested for the Office of Grass and Forage Plant Investigations, and all the important seeds distributed by the Office of Seed and Plant Introduction in any quantity have been tested for purity and germination. The testing of seed for Congressional distribution has necessitated a great deal of work, owing to the large number of sample lots sent in by the contractor. Our facilities for testing the seeds to be supplied for the large contract of next winter are satisfactory and we shall be able to make prompt reports.

STUDIES OF KENTUCKY BLUE-GRASS SEED.

Extensive studies have been conducted upon the curing and methods of germination of Kentucky blue-grass seed. It has been shown that the poor quality of much of the Kentucky blue-grass seed on the market is due to improper harvesting and curing and that this can easily be avoided in the future by changing some of the methods at present in vogue.

STUDIES ON THE IDENTIFICATION OF SEEDS.

These studies have been carried on for the following genera: *Brassica*, *Agrostis*, *Atriplex*, *Lolium*, and *Festuca*. The work on *Brassica*

and *Atriplex* has been completed, but that on the grasses can not be completed this year. This work will be continued in connection with the seed collection, and it is planned to prepare careful descriptions and illustrations of the seeds of the principal economic plants and of weeds.

IMPORTANCE OF THE ORIGIN OF SEED.

Work on the relative value of clover seed grown in the different States and in foreign countries was carried on last year in cooperation with nine experiment stations. In our trial grounds the results were the same as those observed during the previous year's investigations. The plants grown from European seed were utterly unable to withstand our hot sun, and while they made some growth during the cooler spring weather, they ceased growing, and even to a considerable extent dried up, as soon as the intense heat of summer set in. The preliminary reports so far received from the cooperating stations indicate that the same was true in other parts of the country. This work will be carried on for one year more, when it will be considered completed.

NEW WORK IN THE PURE-SEED INVESTIGATIONS.

During the current year it is planned to complete some of the investigations undertaken last year and to carry on the regular work of seed testing, besides conducting investigations on the growing, harvesting, and curing of orchard-grass seed and of redtop seed. Some studies will also be undertaken of the temperatures in the upper 3 inches of the soil during the time when seeds are actually germinating. This work will be made to apply in the first instance to clover seed, since the importance to the Eastern farmer of getting a stand of clover is too great to permit of the subject being longer neglected. The work will be carried on under the direction of competent assistants in various parts of the country, as may be found necessary. Another line of work will be on the treating and preserving of seeds. The difficulty of preserving the germinative power of certain common seeds, as Kafir corn, soy beans, etc., makes it advisable to investigate the methods of growing and storing these seeds, since there is no doubt that with more careful treatment the germinating quality can be considerably improved, insuring a better stand and less danger of failure when the seeds are planted. The treatment of seeds to guard against disease, as in the case of sugar-beet seed and of oats and other cereals, will also be investigated, more especially from the standpoint of the effect of such treatment on the seed. European investigations have shown that it is possible to detect the presence of the disease germ in sugar-beet seed before it is planted. The great increase of the sugar-beet industry in America makes it imperative that we should be in a position to test this seed not only for purity and germination, but also for the presence of disease germs, in cooperation with the Pathologist and Physiologist of the Bureau.

The exorbitant price asked for the seed of hairy vetch, and the fact that the Department explorers have called attention to a number of promising leguminous plants, the seeds of which are not on the market, make it desirable that systematic work be done to determine whether seeds of these plants can be profitably and cheaply raised in some part of the United States. That this must be done before these plants can find popular acceptance is self-evident, since few farmers

would consider it profitable to pay more than $2 or $3 per acre for seed. The cost now of seeding an acre to hairy vetch is between $8 and $10. Plans have therefore been made for experiments on growing seed of hairy vetch and also of rape seed, the use of which is rapidly increasing in this country.

CEREAL INVESTIGATIONS.

A study of the methods and characters used in the determination of different varieties of wheat has been made, and also a study of the methods of chemical analysis applicable to the identification of varieties and the determination of grades. The Algerian durum wheats, including several varieties used in the manufacture of macaroni, have been investigated in Marseilles and in Algeria with a view to their adaptability for introduction into this country. An account of these varieties has been prepared for publication.

It is proposed during the coming year to conduct investigations along three lines, as follows: (1) Wheat varieties; (2) wheat grades; (3) the deterioration of corn in transit.

The work on wheat varieties will include the devising of simple and satisfactory methods for the accurate description of varieties of wheat now being grown or likely to be grown in this country, the systematic classification of the varieties, and the correction of the nomenclature, so as to facilitate experimental and commercial work.

The first work in connection with wheat grades will be the collection of data concerning methods of inspection and grading now in use in the United States. This work is already well under way, and is leading to the discovery of new and apparently valuable methods of determining intrinsic qualities in wheat, upon which a rational system of grading may be based. The system of grading now in vogue seems to do very little but facilitate trade. A statement of grade is not a statement of the real value of a grain, but rather a statement of its condition, so that "legitimate" trading in grain is done very largely on a sample basis. There remains to be worked out a system of grading such that the market will discriminate in favor of what are really the more valuable grades, and that this discrimination may be in effect all the way from producer to consumer. This will lead to the exclusive culture of the more valuable sorts of grain and tend to greatly improve the average quality of the product of the country.

Investigations upon the deterioration of corn are well under way and should be nearly completed by the close of the present fiscal year. Complaints made by Liverpool merchants concerning the condition of corn arriving at that port have been proved to be well founded, as considerable quantities were arriving in bad condition. This was due to the fact that the corn contained too much dirt and too much moisture when put on board ship. Further investigations will be made to determine the actual facts concerning the amount of moisture and of dirt which makes the shipment of corn under those conditions impracticable, and also in regard to methods of improving the condition of corn not fit for shipment.

FIBER INVESTIGATIONS.

Reports received from numerous stations where Egyptian cotton was grown from seed distributed in the spring of 1900 by the Office of Seed and Plant Introduction indicate that this variety may suc-

ceed in some localities along the Gulf coast, and especially in southern Georgia and northern Florida, where sea island cotton is grown away from the coast. Further experiments with this cotton were begun in the spring of 1900 in those regions where favorable results were obtained, and also in Porto Rico and Hawaii.

Experiments in the cultivation of several European varieties of hemp, as compared with improved Kentucky hemp, were instituted in the testing garden of this Department and at six places in the Carolinas. In each instance the Kentucky hemp was superior to the foreign varieties. Some of the hemp grown in the testing garden was water-retted, and although satisfactory facilities for breaking and cleaning the fiber could not be secured, some samples of the fiber itself, examined by an expert linen manufacturer, were pronounced equal to the best grades of imported Italian hemp. In the spring of 1901 seed of several varieties of Japanese hemp were imported through the Office of Seed and Plant Introduction, and they are now being grown in the testing garden and at six other stations. Some of them give promise of much value.

It is proposed during the coming year to continue culture tests with foreign and improved native varieties of hemp and also conduct experiments in the production of flax, and begin work on a classification of American varieties of cotton.

TROPICAL AGRICULTURE.

Even before the acquisition of tropical territory by the United States a large number of inquiries regarding tropical crops and products were received annually from merchants, investors, and colonists. In the last three years popular interest in the Tropics has become general, and the demand for information on tropical botany and agriculture is now very great, and often pressing, especially from those engaged in the production of public and private improvements in the new possessions of the United States. The volume of American investments in tropical countries is also rapidly increasing, and to secure the largest possible share of such capital and enterprise for Porto Rico, Hawaii, and the Philippines, detailed and reliable information is necessary regarding the useful plants and agricultural methods suitable for these islands.

Previous to the appropriation for the year 1901–1902 little in the way of investigations in tropical agriculture could be undertaken, but a beginning was made with a study of the useful plants and agricultural conditions of Porto Rico. Special attention has been given to coffee, which is at once the most important agricultural industry of Porto Rico, and, with the exception of sugar, the largest of the agricultural imports of the United States. A bulletin on shade in coffee culture has been published, in which it is shown that the coffee plantations of Porto Rico are rendered relatively unproductive by use of too much shade. The good effects commonly ascribed to shade are explained as the indirect results of the protection of the soil from drought and of the fertility imparted by the nitrogen-collecting root tubercles of leguminous trees generally planted for shading coffee.

Plans for these investigations contemplate the continuation of the study of coffee and of other crops now grown in the islands mentioned, with a view to the improvement of varieties, methods, and markets, and the investigation of other tropical plants and agricultural methods likely to be of use in the new colonies. Further publications

on coffee and upon the tropical fruits, root crops, and other useful plants of Porto Rico are in preparation.

Existing industries of importance demand earliest attention, but the possibilities of rubber and other cultures which supply the tropical products now imported from foreign countries receive careful consideration. This work is intended to supplement the detailed and localized investigations of the experiment stations which are being established in the new colonies, to connect them with the Department, and to assist in supplying improved plants and methods which may exist in other parts of the Tropics.

INVESTIGATIONS OF POISONOUS PLANTS.

Work on poisonous plants has been carried on in the office, the field, and the laboratory.

One hundred and five cases of plant poisoning, mostly human, have been investigated by correspondence, and more than 800 letters, asking for information about poisonous plants or for the identification of plants supposed to be poisonous, have been answered. The pharmacological collection and the index of information about poisonous plants and those having useful chemical properties have been greatly enlarged.

Field and laboratory investigations on the stock-poisoning plants of Montana, begun in the spring of 1900, were continued during the summer and have been extended to Oregon and Washington. These investigations have resulted not only in the determination of the species causing the greatest loss among stock and the seasons during which these species are most dangerous, but also in the demonstration of an effective remedy, permanganate of potash, by the use of which a large proportion of the loss may be averted. The results of these investigations have been published in Bulletin No. 26 of the Division of Botany.

It is proposed during the coming year to extend the investigations in the field and laboratory and to enlarge the work in the office. There is an urgent demand from many parts of the West for special investigations on the loco weeds, which cause heavy losses of stock nearly every year. Work promising good results has been begun on the loco weeds in Montana. As there are several species of this group of plants having different geographical ranges, this work should be extended to Texas, New Mexico, California, and other parts of the West where stock raising is an important industry. It is hoped that more room and better facilities may be secured for office and laboratory work along these lines.

TESTING GARDEN.

Fifteen acres of land have been added to the testing garden, making a total area of 40.6 acres now cleared and fenced. Variety tests have been made with samples of all seeds for the Congressional distribution suitable for growth in this latitude. Tests have also been made with a large number of the different kinds of seeds imported by the Office of Seed and Plant Introduction, and especially with all plants of the melon family and all soil-renovating leguminous plants. A special study has been made of the varieties of lettuce, seeds of more than 400 named varieties being grown for comparison. A careful record of all these varietal tests has been made. Preliminary experimental work

in soil heating for forcing lettuce and other vegetables gives promise of important results along these lines.

The work proposed for the coming year will include further tests in growing vegetables in artificially heated soil, experiments in celery culture, and the usual variety tests of seeds for Congressional distribution.

MISCELLANEOUS WORK.

During the year three circulars containing popular information, two illustrated bulletins, partly technical in character, and two numbers of Contributions from the United States National Herbarium have been issued. Arrangements have also been made for the publication of other bulletins and numbers of the Contributions, some of which were nearly completed at the close of the fiscal year. An investigation was made, in cooperation with the Division of Forestry, in regard to the botanical resources in northern Arizona and for the purpose of securing data to be used in determining the management of certain forest reserves in that region. The seed laboratory prepared the botanical exhibit at the Pan-American Exposition. The central thought in the exhibit was to show the actual cost of the pure and good seed in the different samples of commercial seed. The apparatus and equipment for a seed-testing laboratory were also shown, as well as a collection of weed seeds and live weeds. The exhibit attracted considerable attention, and it is hoped the popular interest in good seeds will be advanced by it.

The correspondence of the office has necessitated the writing of nearly 4,000 letters. The miscellaneous correspondence now takes a large proportion of the time of the assistant botanist. But while this increased demand for information indicates to some extent an increased interest in botanical subjects and a growing interest in the work of this Department, it takes time that should be given to the work of conducting investigations. It is expected that more satisfactory arrangements may be made for this work during the coming year.

REPORT OF THE AGROSTOLOGIST, F. LAMSON-SCRIBNER, ON WORK OF THE YEAR.

The investigations of grasses and forage plants have been carried on through this office in accordance with plans outlined in the last annual report, particular attention being given to the field work, the collection of seeds of promising grasses and forage plants, the study of the distribution of these plants and their value, and the planning and carrying on of cooperative experiments along various lines with a number of the State experiment stations.

FIELD WORK.

The field work and collection of seeds was placed in the immediate charge of Mr. C. L. Shear, an assistant in the office, who, with a number of agents specially appointed, carried on the work in Colorado, Wyoming, Montana, Washington, Oregon, and Arizona. Efforts were made to secure as large quantities as possible of seeds of grasses and forage plants of known value in arid and alkaline soils. Two agents worked in the northwestern part of Montana, where they secured a large quantity of seeds and roots, as well as specimens of many valuable native species; they also obtained important information regarding the forage conditions and needs of that region. It was found that the stockmen and ranchers were taking an active and increasing interest in the problems connected with grasses and forage

plants, and that there was much appreciation shown for the work which is being carried on by the Department in this direction. Large quantities of seed of native saltbushes were collected in Wyoming. Past experience with these saltbushes seems to indicate that some of them at least may be successfully and profitably introduced into cultivation. Stockmen have already recognized the value of the native saltbushes, and some of them have undertaken experiments in their cultivation. The difficulties encountered in collecting seeds of native forage plants are many. A single species rarely occupies sufficient area unmixed to admit of its being harvested by any of the modern methods of harvesting hay or grain, hence nearly all of the work has to be performed by hand, thus making it rather slow and tedious.

As a result of the field work, seed of about 150 varieties of grasses and forage plants were secured in quantities varying from 100 to 500 pounds. The total amount collected in the field was about 4 tons. Large quantities of roots were secured and transplanted in various localities. Several hundred specimens of interesting species were also secured for the herbarium or for exhibition purposes. Besides the seeds collected, large amounts of commercial seeds have been purchased for use in experiments in different sections of the country in cooperation with experiment stations. About 9 tons of seeds of grasses and forage plants have been purchased from such sources and distributed. About 10½ tons of seed have been distributed to the various State experiment stations. The distribution of these seeds required a large amount of time and labor, as most of them were distributed in small packages, which required separate weighing, packing, labeling, and recording. Card indexes have been kept of all seeds received and distributed, so that by reference to these the amount of seed of any particular variety which has been secured and the parties to whom it has been distributed, with the amounts sent in each case, can be easily ascertained.

The result of the season's work in seed collecting is fully presented in Mr. Shear's report, which was published as Circular No. 9 from the office of the Secretary. This report contains a complete list of the varieties collected, with a brief description of the more important ones. The results of the seed and field work carried on by the office during the past five years is presented by Mr. Shear in Bulletin No. 25, now in press.

COOPERATIVE WORK.

In years past much cooperative work has been carried on between this office and the State experiment stations in the cultivation of new and untried grasses, as well as in the preparation of bulletins relating to the grasses or forage resources of different parts of the country, but not until the present year has any real effort been made to organize the work upon a systematic scheme or plan. Articles of agreement have been drawn up by this office and submitted to the directors of the experiment stations for approval. The following are examples of these articles of cooperation:

Articles of cooperation in investigations on improvement of the Northwestern ranges between the ———————— Agricultural Experiment Station and the Division of Agrostology, United States Department of Agriculture.

The object of these investigations shall be to find the best and most practical way of improving the forage conditions in the dry sections of the Northwest, and specially of renewing the worn-out ranges and devising methods of managing

them whereby the highest degree of productivity may be maintained. The following plan of cooperation is agreed upon:

1. The ———————— experiment station to procure a suitable tract of range land; to undertake immediate supervision of the work through a member of its official staff, and to furnish all implements, fencing, etc., required by the investigations, the same to be the sole property of the station when this cooperative arrangement is dissolved.

2. The U. S. Department of Agriculture, through the Division of Agrostology, to assist in selecting the land and in planning and conducting these investigations; to furnish seed of native and introduced grasses and forage plants for experiments on said tract, and pay other expenses connected with the investigations not to exceed ———— in any one fiscal year, it being understood that under the appropriation act the Department can not assume responsibility for the continuance of its contribution beyond June 30, 1901.

3. The investigations conducted under this cooperative agreement shall be planned conjointly by the representatives of the ———————— experiment station and the Division of Agrostology, officially charged with the work, subject to the approval of the proper authorities in each case.

4. Both parties to this agreement shall be free at any time to use the results obtained in these investigations in their official correspondence and publications, giving proper credit to the fact that such results have been secured by cooperative work.

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Director ———————— *Experiment Station.*

———————————

Chief Division of Agrostology.

Approved:

———————————

Secretary of Agriculture.

Articles of cooperation in grass and forage plant investigations between the ———————— *Agricultural Experiment Station and the Division of Agrostology, United States Department of Agriculture.*

The object of these investigations shall be to find the best crops for supplying forage to supplement the natural ranges and for the improvement of cultivated lands. The following plan of cooperation is agreed upon:

1. The ———————— experiment station to provide land at the home station, or at outlying representative points in that territory, upon which to make said experiments, and to undertake the immediate care and supervision of the work.

2. The U. S. Department of Agriculture, through the Division of Agrostology, to furnish all seeds necessary in making these experiments, and to otherwise assist in planning and conducting said investigations.

3. The investigations conducted under this cooperative agreement shall be planned conjointly by the representatives of the ———————— experiment station and the Division of Agrostology officially charged with the work, subject to the approval of the proper authorities in each case.

4. Both parties to this agreement shall be free at any time to use the results obtained in these investigations, giving proper credit to the fact that such results have been secured by cooperative work.

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Director ———————— *Experiment Station.*

———————————

Chief Division of Agrostology.

Approved:

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Secretary of Agriculture.

The lines of work which have been taken up in cooperation with the stations, in accordance with these signed agreements, include a great variety of problems. Some of these problems, together with the stations with which they have been severally taken up, are: To find the best and most practical method for the formation and management of meadows and pastures in the Middle Southern States, in cooperation

with the Tennessee experiment station; the testing of drought-resistant grasses and forage plants likely to be of value in the range region, in cooperation with the South Dakota experiment station; the best crops for supplying forage to supplement the natural ranges and for the improvement of cultivated lands, in cooperation with the New Mexico experiment station; the best and most practical method for the formation and management of meadows and pastures in the Middle Western States, in cooperation with the Missouri experiment station; the best grasses for fixing the drifting sands along the Great Lakes and to determine the possibility of converting these into lands productive of forage and other crops, in cooperation with the Michigan experiment station; to find the best grasses for fixing the drifting sands on the Pacific coast, and to determine the possibility of rendering such lands productive of forage and other crops, and the selection and improvement of varieties of grasses, in cooperation with the Oregon experiment station; the improvement and renovation of worn-out hay and pasture lands, in cooperation with the New Hampshire experiment station; the use of cover crops for orchards, in cooperation with the Delaware experiment station; pasture and range improvement, in cooperation with the Kansas experiment station; to find the best crops for use in securing a continuous soiling series for dairy and farm stock in the Eastern United States, in cooperation with the Maryland experiment station; to find the best and most practical way of improving the forage conditions in the dry sections of the Northwest, and especially of renewing the worn-out ranges and devising methods of managing them whereby the highest degree of productivity may be maintained, in cooperation with the Washington experiment station; grasses and forage plants for alkali soils, in cooperation with the Wyoming experiment station; to find the best and most practical way for the formation of meadows and pastures and to discover methods of managing them whereby the highest degree of productivity and usefulness may be maintained, in cooperation with the Texas experiment station; to find the best and most practical way of improving the forage conditions in the arid Southwest, and especially of renewing the worn-out ranges and in devising methods of managing them whereby the highest degree of productivity may be maintained, in cooperation with the Arizona experiment station.

Articles of cooperation have now been signed with thirteen of the State experiment stations. A report of the organization of this plan of cooperation was published as Circular No. 8 from the office of the Secretary. This report was by Mr. Thomas A. Williams, now deceased, and was based on personal visits to many of the State stations, where the subject of the experiments and manner of cooperation were fully discussed with the station officials. This work has been continued by Prof. A. S. Hitchcock, of Kansas, who has been placed in charge of cooperative experiments. Reports of progress have already been received from some of the stations, the one from Arizona, prepared by Dr. David Griffiths, expert in field management, deserving special mention.

ARIZONA.

The cooperative work with the Arizona experiment station is in the line of range improvement, the land selected for the purpose occupying what is described in the Government surveys as sections 27, 34, 35, and 37, T. 14 S., R. 14 E., Gila and Salt River meridian, and by order of the President this land was withdrawn from entry and set aside for

use of the Department in experiments with grasses and forage plants. This tract of land is near Tucson, although some 400 feet higher, and is about 2,600 feet above the sea level. The land was fenced, and when selected in September, 1900, the ground was bare, except for cacti and a few small shrubs of little or no value for forage. From January until March the ground was fairly well covered with short-lived annuals, the most conspicuous being California poppy and tufted plantain, which latter is of some value for grazing. It is evident that the present unproductive condition of the ranges in this part of Arizona is due in the greatest measure to overstocking and injudicious management. The perennial grasses have been completely destroyed on a large portion of the range and can not be restored except by fencing and reseeding. Some 52 acres of the fenced portion of the reservation are now under cultivation, and this area has been divided into 60 plots, upon which about 40 species of forage plants have been sown.

One correspondent living in Oracle, Ariz., in replying to the inquiries relative to forage conditions of the Territory, states:

> The present unproductive conditions are due entirely to overstocking. The laws of nature have not been changed. Under similar conditions vegetation would flourish on our range to-day as it did fifteen years ago. We are still receiving our average amount of rainfall and sunshine necessary to plant growth. Droughts are not more frequent now than in the past, but mother earth has been stripped of all grass covering. The very roots have been trampled by the hungry herds constantly wandering to and fro in search of food. The bare surface of the ground affords no resistance to the rain that falls upon it, and the precious water rushes away in destructive volumes, bearing with it all the lighter and richer particles of the soil. Vegetation does not thrive as it once did, not because of drought, but because the seed is gone, the roots are gone, the soil is gone. This is all the direct result of overstocking and can not be prevented on our open range, where the land is not subject to private control. I respectfully urge upon you the importance of impressing the Government officials with the fact that no general improvement of range country can be expected until the land is placed under individual control by lease or otherwise. The greater part of our range country is at present desert and will steadily become less and less productive while the present range management, or rather lack of it, prevails.

In March and April of the present season Mr. Shear visited the experiment stations of Kansas, Texas, New Mexico, and Arizona, with the view of inspecting the grass and forage-plant work being carried on in those States, and especially to inaugurate the experiments to be carried on in cooperation with the Kansas station on the farm of Mr. H. B. Waldron, of Anthony, Kans. The work here planned is the trial of various methods of improving the range and pasture lands and the introduction of such grasses and forage plants as may give promise of success in this general region. Seeds of grasses and forage plants collected or purchased by the office have been supplied in large quantities to a number of experiment stations with which no articles of cooperation have been signed, being sent either directly to the stations or to individuals upon the request and recommendation of the station officials.

ABILENE, TEX.

The experiments in range improvements which this Department has been carrying on during the past three years at Abilene, Tex., under the immediate supervision of Mr. H. L. Bentley, have been concluded, and Mr. Bentley's final report of the operations for the entire period and results obtained is now in the hands of the Agrostologist. This report is a most interesting one, and the work at Abilene has

clearly demonstrated the possibility of greatly improving the cattle ranges with comparatively little cost. Through the plan pursued at Abilene the stock-carrying capacity of the range land selected for the experiments was doubled, and Mr. Bentley asserts that it is not only possible to restore the worn-out and grass-denuded ranges to their former productiveness, but that while this is being done cattle may be held on the pastures each year, the proportion increasing year after year as the capacity of the pastures to sustain them shall be increased. The work accomplished at Abilene has attracted much attention, as the question of range improvement is a most important one, and no work undertaken by the office is more promising of useful results.

GRASS GARDENS.

During the past year grass gardens have been maintained on the Department grounds on the Potomac Flats, District of Columbia, and one was established as a part of the exhibit of this Department on the grounds of the Pan-American Exposition at Buffalo, N. Y. The garden on the Department grounds has been remodeled, to bring it more in the line of an educational exhibit than of an actual series of experiments with grasses and forage plants. The center of the garden is occupied by a series of beds or plots of native and introduced pasture grasses. These are kept closely mown, to imitate as nearly as possible the actual grazing by stock, with the intention of determining in part which will best stand such treatment. The rest of the garden is devoted to displaying as many varieties as possible of native and introduced grasses, clovers, and other forage plants. A series of plots containing eight different species of clovers has been planted, in order that the habit of each species may be studied by comparison with that of the others. Several plots of alfalfa sown with seed derived from different parts of the world illustrate the relative hardiness and productiveness of these different sorts. An artificial sand dune has been placed in the garden, and upon it have been planted a number of sand-binding grasses. A similar but more extensive dune was placed in the garden at the Pan-American Exposition, and there the sand binders found upon the Atlantic and Pacific coasts and in the sandy regions of the interior have been grown successfully, both from seed and from transplanted roots. About 250 species are included in the garden on the Department grounds, and nearly half that number are growing in the garden at Buffalo.

The work of testing the various native and introduced grasses and forage plants on the Potomac Flats was begun in the spring of 1900 and is still in progress. During the season of 1900 about 400 different plants were grown on the flats and full notes taken concerning their growth, relative hardiness, time of maturity, seed production, etc. The report of the work conducted on the flats was prepared by Mr. C. R. Ball, to whom has been assigned charge of the grass garden and all experiments with grasses and forage plants in the District of Columbia, and was submitted at the close of the season and published as Circular No. 28 of this office. The work of this season was seriously delayed in the spring on account of protracted wet weather, and it has been interfered with by the dredging operations which are now being carried on. This work on the flats will be transferred to the experiment farm at Arlington another season. At the present time the grass garden on the grounds of the Pan-American Exposition is in excellent condition and has attracted a great deal of attention from

visitors. Much of the success of this garden is due to the intelligent efforts on the part of Mr. Thomas Hanley, an expert in the office, who has had immediate care of it.

WINTER PASTURAGE.

In February of the present year Mr. Ball, assistant agrostologist, visited the States of Alabama, Mississippi, and Louisiana for the purpose of investigating the problem of winter pasturage. There is almost universal demand for such crops throughout this region, and the experiment stations of these States are carrying on rather extensive tests of the most promising plants, and some very successful results have been obtained. For the most part the planters had not acted upon the practical suggestions which they had received, largely because of the cost of the required seed and also on account of the extra labor involved. There is scarcely any portion of these States where a winter pasture crop, especially one of a leguminous nature, would not pay through the increased fertility of the soil and the better condition of the sod. The results of these studies will appear in a report now in preparation which will embody results of field work by Mr. Ball in Louisiana and by Mr. Combs in Florida.

EXTERMINATION OF JOHNSON AND OTHER NOXIOUS GRASSES.

Under instructions from the Agrostologist an expert was sent to the Gulf States to make an investigation of the problem of exterminating Johnson grass. To this end 15 acres of land were secured in the black waxy lands of east central Texas and a series of experiments inaugurated for the purpose of demonstrating the most economical and effective methods of destroying this pest in cultivated fields. At the same time full investigations of its relative value and the best means of utilizing it as a hay and pasture crop were made. It was found that in those States where it had been longest introduced planters had become thoroughly familiar with it and were able to successfully control it on their plantations, at the same time making free use of it as a hay crop, for which purpose it made the land fully as remunerative, acre for acre, as the best cotton lands of the rich river bottoms. The first problem to be solved in connection with Johnson grass is the prevention of its rapid spread by means of seed carelessly and needlessly scattered over wide areas. This matter lies largely with the farmers themselves, and when once they are fully awake to the necessity of doing this the problem of control and of extermination, where desirable, will be comparatively easy of solution, and at the same time an exceedingly valuable hay crop will have been added to the agricultural resources of the Southern States.

Crab grass has become a serious pest in the lawns of the Middle and Southern States. It has been particularly aggressive on the newly made lawns of the Department grounds this season, and vigorous measures are being adopted to destroy it.

HERBARIUM WORK AND COLLECTIONS.

The work on the collections and herbarium has been placed in the immediate charge of Mr. Elmer D. Merrill, and there has been a marked improvement in the condition of collections and a very satisfactory growth. The arrangement of the herbarium has been changed from the sequence of Bentham and Hooker to that of Engler and

Prantl, and the old and much-worn genus covers have been replaced by new ones. During the year 5,208 specimens have been added to the herbarium, 1,776 of which were received through the National Museum; 4,054 specimens of grasses have been determined, most of these having been sent to the Department for identification; and 1,669 specimens have been distributed to educational institutions. The herbarium forms the basis of the more technical investigations carried on in the office of the Agrostologist, and the results of studies of the collections during the past year have been made the subject of two bulletins and six circulars. In these publications 77 new species and varieties are described. The North American species of the genus *Stipa* are now being revised by Mr. E. N. Wilcox, a scientific aid in the office, and all our North American material of the genus *Paspalum* is in the hands of Mr. George V. Nash, of the New York Botanical Garden, who is engaged in a revision of that genus under commission from this office. Preliminary work has been done on a proposed index to the North American *Gramineæ*, to include a full synonymy, and at present about 3,000 cards have been completed. Some work has been done on a monograph of the grasses of Alaska for the report of the Harriman expedition, and a monograph of the New England species of the genus *Panicum* has been prepared and published in a New England botanical journal.

One of the most valuable collections received during the year is a collection of the grasses of Chile. This comprises some 500 species, representing the grass flora of that country, and especially the types or typical material of nearly all the species described by R. A. Philippi. This valuable collection is to form the basis of a monograph of the grasses of Chile, to be prepared by the Agrostologist, and is to be returned to the University of Santiago, Chile, on completion of this work.

PUBLICATIONS.

During the year this office has issued 6 bulletins, 6 Farmers' Bulletins, 13 circulars, and 4 papers from the Yearbooks of the Department. The bulletins, one of which is a reprint, revised, discuss fodder and forage plants; studies on American grasses; and a revision of the North American species of *Bromus* occurring north of Mexico. The Farmers' Bulletins issued are reprints, for which large demands have been made, and discuss Southern forage crops; millets; alfalfa, or lucern; meadows and pastures; and cowpeas. The circulars discuss the following subjects: Turkestan alfalfa; agrostological notes; grasses and fodder plants on the Potomac Flats; the grasses in Elliott's "Sketch of the botany of South Carolina and Georgia;" new or little-known grasses; bermuda grass; some Arizona grasses; range-grass and forage-plant experiments at Highmore, S. Dak.; report of progress; the cultivated vetches; *Aristida purpurea* Nutt. and its allies; publications of the Division of Agrostology; cooperative grass and forage plant investigations; collection and distribution of grass seed; and field work. The papers prepared for the Yearbooks discuss grasses as sand and soil binders; progress of economic and scientific agrostology; succulent forage for the farm and dairy; and our native pasture plants.

PAN-AMERICAN EXPOSITION.

In addition to the grass garden established on the exposition grounds and already referred to, the office has spent some time in the

preparation of an exhibit of grasses and forage plants in the north wing of the Government building assigned to the Department of Agriculture. This exhibit consists of a large series of photographs illustrating the grasses and forage plants and general features of various parts of the country where forage problems are being discussed. A series of 60 transparencies, 11 by 14 inches, contained in a specially constructed cabinet, illustrates similar subjects. In three double pavilions are exhibited a number of forage plants and grasses on panels similar to those exhibited in Paris last year. There are 18 of these panels, and the plants exhibited include range grasses, pasture grasses, grasses used as sand binders, saltbushes, and various leguminous plants used for forage. In the same case are exhibited a set of seeds of native grasses and forage plants numbering some 90 varieties.

The outside exhibit on the grounds, or the grass garden, is located just east of the Government building and south of the live stock pavilions. It is the first attempt of the kind to exhibit so large a series of agricultural grasses and fodder plants, and in spite of some difficulties in the way of inferior soil, lack of proper drainage, and lateness of the season, due to protracted spring rains, the exhibit is a very creditable one. A unique feature in this exhibit is a sand dune, artificially prepared, upon which are growing grasses native to the sands along the Pacific coast, along the Atlantic seaboard, the shores of the Great Lakes, and the sandy deserts of Wyoming and Idaho.

REPORT OF THE POMOLOGIST, G. B. BRACKETT, ON WORK OF THE YEAR.

ROUTINE WORK.

In consequence of the responsibility laid upon this office in directing the horticultural exhibit of the United States at the Paris Exposition of 1900, the routine work of the year has been especially heavy. This was particularly true with regard to correspondence, that relating to exposition work having continued heavy until after the middle of the fiscal year. At the same time the correspondence relating to the regular work has shown the usual increase. The number of letters written was more than 25 per cent larger than in the previous year, while a large volume of routine correspondence was conducted by means of circulars.

As in former years, the examination and reporting upon the large number of specimen fruits received by mail for various purposes occupied the time and attention of several persons during the ripening season. About 1,800 lots of fruit have been thus passed upon, nearly 700 lots having been sent by growers for identification. It is gratifying to note that, notwithstanding the wide geographical range represented by these specimens, more than two-thirds of them were satisfactorily identified and the senders duly informed concerning the correct names of the fruits grown by them. This is of much importance to those who desire to extend their plantings of varieties that have been found adapted to their localities but are of unknown identity, as well as to those who have found that certain varieties in their orchards are worthless there and should be avoided in new plantings.

The increasing number of persons who consult the office in this way indicates the importance of the work to the practical fruit grower. The receipts of the past year include practically the entire range of

fruits grown in the continental area of the United States, together with specimens from eight foreign countries.

About 500 technical fruit descriptions have been added to the files during the year, together with about 300 accurate water-color paintings and 240 facsimile models, in addition to 270 duplicate models prepared for exhibition at the Pan-American Exposition. About 200 mounted herbarium specimens and a considerable number of photographic negatives have been added to the collections.

DISTRIBUTION OF TREES, SCIONS, CUTTINGS, PLANTS, AND SEEDS.

In continuation of the cooperative work with the Office of Seed and Plant Introduction, a larger number of promising varieties of fruit-producing species—about 400 varieties, representing about 50 species—has been received and distributed than in any previous year. These distributions comprised more than 200 varieties of the apple, received from French, German, Swedish, and Australian, as well as domestic sources; nearly 70 varieties of the plum, chiefly of the prune and mirabelle types, from France, Germany, and Austria, and 27 varieties of grapes, mostly foreign.

Through the agency of the comprehensive list of voluntary correspondents, which has been systematically developed, revised, and enlarged, such material of this kind as now reaches the Department at almost any time of year can be promptly placed in the hands of intelligent propagators, where it can receive a careful and thorough test to determine its relative value without loss of time. It thus requires but a small expenditure for stock of a promising new foreign variety or species to insure its wide distribution in regions suitable for determining its probable commercial usefulness.

FRUIT EXHIBIT AT THE PARIS EXPOSITION.

The continuous fruit exhibit at Paris, referred to in the report of the previous fiscal year, was maintained without intermission until the close of the exposition, October 31, 1900. As a precautionary measure a sufficient supply of apples of the crop of 1899 had been provided in that year to insure a continuous display of this fruit throughout the exposition, even if the crop of 1900 had entirely failed. The crop of 1900 having proved to be of fair quality and quantity, taking the country as a whole, the reserve stock of 1899 was crowded forward to the exposition tables as rapidly as possible, where it was largely replaced during the last half of the exposition period by fruit of the current crop. Enough of the old fruit was reserved to maintain a continuous show, however, and to provide against any probable emergency, such as the failure of a shipment to reach Paris at the appointed time.

Four shipments of fruit of the crop of 1900, embracing 265 varieties of apples, 130 of pears, 16 of peaches, and 58 of plums, from 15 States, were made in August, September, and October. After a thorough preliminary investigation it was considered possible, with existing transportation facilities, to forward such shipments from New York to Paris in an average time of not less than ten days, and the shipments were arranged for on that basis. It is gratifying to record that none of the four shipments made was longer than ten days in transit, while that which contained the largest quantity was delivered at the exposition eight days and nineteen hours after leaving New

York. With but very few exceptions these fruits, even peaches and plums, carried well and reached their destination in excellent condition. The exhibit continued to arouse great interest among visitors at the exposition, and frequent inquiries were received for sources of commercial supplies of American apples, oranges, and pecans.

The awards made to American exhibitors in this class (No. 45 of the exposition classification, "Fruit trees and fruits") were merited by the quality of the products shown. These were 106 in number, comprising 6 grand prizes, 23 gold medals, 39 silver medals, 31 bronze medals, and 7 honorable mentions, a total of more than 20 per cent in excess of the awards to any other foreign country.

The ultimate beneficial effect of this exhibit upon the future of our export trade in fresh fruits can hardly be overestimated, as the magnitude and duration of the display afforded convincing proof to dealers and consumers of the practicability of handling many kinds of American fresh fruits in European markets. Taken in connection with the fair crop of winter apples in the Northern States and the large crop of oranges in California, it may reasonably be credited with a share of the gratifying increase shown in the exports of these fruits during the year just closed.

Exports of apples and oranges for the fiscal years 1899–1901, inclusive.

Year.	Apples.		Oranges.
	Barrels.	Value.	Value.
1899	380,222	$1,210,459	$282,313
1900	526,636	1,444,655	271,468
1901	855,673	2,058,964	436,560

INVESTIGATION OF THE PRUNE INDUSTRY IN EUROPE.

As a result of the rapid development of commercial prune culture in the Pacific Northwest (Oregon, Washington, and Idaho) in recent years, some serious problems have been encountered, which have appeared at times to threaten the future of the industry. Prominent among these has been the difficulty experienced in producing a product of uniform quality with the existing methods of harvesting and curing.

This difficulty is greatly increased by the fact that the variety chiefly planted in the region referred to—Italian prune, synonym *Fellenberg*—ripens rather too late for good harvest weather in many sections where large prune orchards have been planted, and is frequently injured in quality and reduced in quantity by the occurrence of early autumn rains. The most promising remedy for this condition appears to lie in the line of originating or discovering a variety possessing the desirable qualities of the Italian and ripening a week or ten days earlier. With a view to determining whether a variety possessing the desired characteristics is known in the prune-growing sections of Europe, Prof. E. R. Lake, of the Oregon Agricultural College and Experiment Station, was, upon my recommendation, appointed a special agent on the roll of the office of the Botanist, with instructions to investigate this question in France, Germany, and Austria, the chief sources of the European supply of choice prunes. This he accordingly did during the summer and autumn of 1900, in the three countries mentioned,

making careful observations of the varieties grown and methods followed in the culture, curing, and marketing of this crop. Professor Lake secured trees and scions of a number of varieties of prunes and mirabelle plums that promise to be of value in various sections of the country. These have been placed with a number of careful experimenters for trial. An interesting report on the methods of growing, curing, and marketing of prunes in the countries visited by Professor Lake in the course of this investigation is now in press and will soon be issued as a bulletin of this office.

EUROPEAN TABLE GRAPES IN SOUTH ATLANTIC STATES.

The small experimental vineyards of European table grapes on resistant stocks in Florida and North Carolina have been maintained during the year. That at Earleton, Fla., continues to give promising indications of ultimate success in the effort to introduce the culture of this delicious fruit into sections where the winters are mild and the rains at the ripening time not excessive. The remarkably vigorous wood growth of most varieties on resistant stocks at Earleton leaves little doubt regarding the congeniality of the climate in that respect, and an abundant crop of fruit set on the two-year-old vines of many varieties in the vineyard testified to their productiveness under the methods of fertilizing, pruning, cultivating, and spraying practiced there.

Some trouble from mildew and black rot was experienced this season, but not more than may be reasonably considered within the range of control by modern spraying methods. The most serious difficulty experienced there this year was the effect of the unusually heavy and long-continued summer rains. These began in May, much earlier than usual, and continued through June and July with little intermission, causing much bursting of fruit about to ripen. Owing to the lateness of the opening of spring in the South this year the injury to the fruit was probably disproportionately large, as the rains came on before any but the very earliest varieties were ripe. Notwithstanding this, several varieties have given evidence of distinct value for Florida and adjacent sections. These will be propagated on resistant roots for further experimental distribution.

The North Carolina vineyard is in less promising condition. It suffered from the effects of the severe drought of the summer of 1900, and again during the present season from an epidemic of black rot, which was not controlled by the spraying methods practiced, either on the vinifera vines or the large commercial vineyards of Niagara in the same region. The problem of disease control will receive special attention at this vineyard during the present fiscal year, and it is hoped that in cooperation with the Pathologist and Physiologist methods of treatment may be devised through which this disease may be more successfully combated there. Fruit of a considerable number of varieties was successfully matured, however, at this vineyard, and several sorts are considered very promising for further test.

Some of the newly introduced Franco-American hybrids of European and American grapes, designated "direct producers" by the French, promise to have distinct value in the South, and will be distributed for testing in other grape-growing sections. These hybrids, while producing fruit of good quality, are at the same time resistant to Phylloxera, thus rendering the grafting process unnecessary in vineyard practice.

NUT-PROPAGATION EXPERIMENTS.

In an effort to discover some practicable nursery method of propagating walnuts and hickories in the Middle and Northern States, certain experiments in greenhouse propagation were undertaken with the Persian walnut, the pecan, and two species of hickory.

The essential feature of these experiments, which were planned and carried on by Mr. William P. Corsa, of this office, consisted in the control of conditions of temperature and humidity during the period when the newly set grafts were undergoing the callusing process. At the same time special precautions were taken to protect the newly grafted trees from injury by certain insects and fungi which thrive at the relatively high temperature considered necessary for successful callusing of these species.

The stocks used were mainly one-year-old seedling trees, and several allied species were tested under similar conditions for each kind of scion used. These were planted in pots after being grafted and callused, and were permitted to start and continue in growth until the climatic conditions warranted their transplanting to the open ground in early May. Up to this point the results obtained were, on the whole, encouraging. Later developments in the open ground considerably reduced the proportion of successful grafts, apparently through the destructive effect of the intense heat of the sun upon the newly planted grafted trees.

The experience gained in these experiments will be utilized in future work along similar lines, as the subject is considered one of great importance in view of the growing interest in nut culture in the United States.

CARD CATALOGUE.

The work on the card catalogue of fruits has been continued during the year by Prof. W. H. Ragan, who has it in charge.

The varieties of the important tree fruits and grapes in the standard pomological works published in America having been catalogued, the listing of such varieties as have been listed or described only in nursery catalogues, horticultural periodicals, horticultural society reports, and similar publications has now been taken up.

EXHIBIT AT THE PAN-AMERICAN EXPOSITION.

The exhibit prepared for the Pan-American Exposition by the office consisted of four distinct features:

(1) A comprehensive collection of fruit models, illustrating the more important varieties of the several fruits grown in the United States. This consisted of more than 1,000 specimens, representing about 850 named varieties belonging to 62 distinct botanical species.

(2) An exhibit illustrating the standard commercial grades of apples as adopted by the National Apple Shippers' Association and now generally recognized throughout this country and Canada in commercial transactions in this important fruit.

(3) A collection of named varieties of pecans from the Gulf States.

(4) A collection of photographs illustrating certain characteristic features of the horticulture of the United States.

As the material for this exhibit is drawn largely from the working collections of the office, and as the work of preparation and instal-

lation was done entirely by employees of the office, the actual expenditure of exposition funds was very small.

In view of the fact that this work seriously interferes with important lines of investigation in progress, I would strongly recommend that for future expositions a sufficient allotment of funds be provided to make possible the preparation of suitable exhibits without encroaching upon the regular and urgent work of the office.

CURRENT WORK.

Under the reorganization of the Department, through which the Division of Pomology becomes a part of the newly organized Bureau of Plant Industry, it is expected that the work heretofore done by that Division will be carried forward without radical change. As the regular routine duties of the office may be expected to increase even more rapidly in the future than has been the case in the past, it is imperative that an additional increase of the working force be provided to keep pace with it.

Such pomological exhibits as are to be made at the St. Louis Exposition of 1903 will need to be planned and carried well toward completion during the present fiscal year, as the uncertainty regarding supply of suitable material at the exact time needed is greater in this line than in any other branch of the Departmental work.

In view of the increased appropriation for pomological investigations for the present fiscal year, and the authorization of certain lines of work recommended in the report of last year which require extensive field investigation and experimental work, these special lines of investigation have been placed in charge of Mr. William A. Taylor, the former assistant pomologist, who is now designated pomologist in charge of field investigations. Under his direction the work of investigating market conditions affecting the domestic and export trade in fruits and vegetables, the continued effort with European grapes in the South, and the mapping of commercial fruit districts will be prosecuted as rapidly as the circumstances and the appropriations available will justify. It is intended that the investigation in each of these lines shall be in immediate charge of an expert, who shall familiarize himself with the details of the work in that line, and who shall, so far as is possible under the circumstances, concentrate his efforts during the greater part of the year upon that particular subject.

The investigation of methods of harvesting, transporting, storing, and marketing fruits will naturally take precedence of other lines during the present year. Plans are being made under which it is expected that fruit growers will cooperate with the Department in making such experimental export fruit shipments as seem advisable to determine the facts regarding sizes and styles of packages, methods of wrapping and packing, character of transportation (including refrigeration), and other points concerning which there is disagreement among shippers. As now outlined, the experimental work of the present season will be devoted especially to the apple and pear, both in the export and the storage experiments, these being considered the most important fruits in the export trade at the present time.

The European grape work in the South will be conducted along the line previously followed, namely, that of endeavor to bring to light varieties yielding fruit of fine table quality, which when grafted upon resistant stocks and protected from leaf and fruit diseases by spray-

ing may be expected to succeed in our Southern States. Special attention will also be given to the problem of Phylloxera-resistant stocks for the Pacific coast and to direct producers suited to Eastern grape districts.

The mapping of fruit districts will be based at the outset upon the recorded experience of growers, reinforced and corrected by careful field investigation by experts, and shaped so far as possible to conform to the topographic and geologic map work already done by the United States Geological Survey and the soil maps now being prepared by the Bureau of Soils of this Department.

EXPERIMENTAL GARDENS AND GROUNDS.

WORK OF THE YEAR.

The work has been directed during most of the year by the chief of the Bureau, but recently the details have been put in charge of Mr. L. C. Corbett, horticulturist of the Department. Mr. Corbett submits the report, setting forth the progress of the work of this branch.

The general scheme of work outlined in the last annual report by the Director of Plant Industry has been put into effect, and the close cooperation of this branch with that of Plant Physiology and Pathology, Agrostology, Pomology, Botany, and Seed and Plant Introduction has become a reality.

DISTRIBUTION OF PLANTS, BULBS, ETC.

During the year the customary distribution of plants has been maintained, the records showing that the following sorts, to the number indicated, have been distributed:

Distribution of bulbs, plants, etc., 1900-1901.

Bulbs, consisting of hyacinth, tulip, crocus, narcissus, Japan lily, tuberose, etc. (Congressional distribution)		113,835
Bedding plants		20,000
Camphor plants		795
Fig cuttings	bundles	1,087
Fig cuttings		1,600
Ginkgo trees		701
Grapevines (Congressional distribution)		19,937
Miscellaneous plants, including Ampelopsis, Citrus trifoliata, cinnamon, coffee, currant, guava, palms, pepper, pineapples, privet, rubber plants, vanilla, etc		4,076
Olives		355
Peonies		500
Phlox		500
Privet cuttings		5,000
Strawberry plants (Congressional distribution)		66,843
Tea plants		1,433
Tea seed	pints	18
Willow cuttings		2,500
Young shrubs (miscellaneous)		2,000
Young trees		1,800

Much time has been devoted to the pruning of shrubs and trees about the grounds. The growth of others has made the removal of some specimens necessary in order to preserve those of most value. In all cases, when the future preservation of rare and valuable specimens has been involved, such crowding trees have been removed.

PLANTING.

A large number of annual bedding plants have been placed about the grounds, with the result of adding very considerably to the general effect. Besides the planting of annual bedding plants the collection of ornamental shrubs upon the grounds has been somewhat enlarged.

ECONOMIC COLLECTION.

The plants which supply food for man or which are used by him in the arts are at present well represented in the economic collection in the conservatories. This collection, which is already one of the most complete in America, is constantly being added to by introductions from our new possessions, as well as from foreign countries. In building this collection cooperation with the Office of Seed and Plant Introduction has proved very helpful.

PLANT PROPAGATION.

Besides the work of propagating new and rare plants brought in through the Office of Seed and Plant Introduction, a number of plants of the classes named are being grown for use upon the grounds and for dissemination, as follows:

New and rare plants grown.

BEDDING PLANTS ON GROUNDS.

Abutilon	300
Acalypha	100
Alternanthera	2,200
Canna	150
Coleus (in variety)	2,900
Cuphea (in variety)	100
Geraniums (in variety)	1,400
Iresine	800
Salvia	600
Total	8,550

FLOWERING PLANTS ON GROUNDS.

Aster	500
Bouvardias	250
Dahlia	100
Dianthus	350
Feverfew	250
Gladiolus	350
Marguerite	350
Rudbeckia	600
Roses (in variety)	2,200
Total	4,950

TREES AND SHRUBS ON GROUNDS.

Evergreens	85
Miscellaneous shrubs	100
Young shade trees	50
Total	235

PLANTS IN NURSERY PROPAGATED FOR STOCK AND SPECIAL DISTRIBUTION.

Abutilon	1,500
Ageratum	800
Alternanthera	6,000
Begonia	600
Carnation	4,000
Chrysanthemum	2,500
Coleus	6,500
Cuphea	700
Dahlia	250
Geranium	3,000
Geranium (scented)	500
Iresine	4,000
Rose	4,000
Salvia	1,500
Butternut	230
Black walnut	335
English walnut	150
Olive	2,200
Pecan	375
Pecan (Miller seedlings)	120
Pecan seedlings, improved sorts	7,000
Apple seedlings	100
Grape	30,000
Calycanthus floridus	25
Catalpa	200
Chionanthus virginica	30
Elm (American)	175
Ginkgo biloba	59
Ginkgo biloba (seedlings)	7,500
Linden (American)	65
Maple (black)	85
Maple (silver)	60
Maple (Norway)	110
Oak (pin)	65
Oak (willow)	5
Tulip	13
Willow	2,000
Yellow wood	225
Total	86,977

SPECIAL CROPS.

The two special crops which are now under study are roses and carnations. The object of the work with these plants is to develop improvement in cultural methods which will render the cultivation of these crops more remunerative to commercial growers. This work involves a study of soil conditions and light and heat requirements, as well as the structure best suited to secure these conditions.

PLANS FOR FUTURE WORK.

The aim in the management of the grounds will be to maintain typical specimens of each of the various hardy trees and shrubs adapted to lawn planting in this climate. This collection is already one of the best in the country, but additions are needed from time to time to make it complete. As an addition to the collection of ornamental plants, it is proposed to devote considerable area to introduced hardy herbaceous annuals and perennials, and to arrange them for landscape effect, rather than according to their botanical affinities. It is believed that such a collection will demonstrate the value of our native, and at present neglected, plants, and enable many flower lovers, whose income

will not admit the purchase of rare and beautiful plants, to produce equally as pleasing effects without cost and with the expenditure of a minimum amount of labor.

The study of special crops and their requirements will be made a still larger feature of the work as soon as facilities for its prosecution can be provided. This will include the commercial crops grown by the florist, such as roses, carnations, violets, etc., and vegetables, such as lettuce, radishes, tomatoes, cucumbers, etc., which form important commercial crops during the winter months.

We now have in our collection many plants which are of more than ordinary interest and value, because they are the parent stock from which an industry has sprung up. The Washington navel orange may be noted as an example. The unusual interest which centers about plants of this kind is sufficient reason for justifying the expenditure of time and money in their preservation, and to this end a house will be erected in which such interesting specimens may be cared for.

With the growing interest in the cultivation of the European grape on resistant stocks, both in Eastern and Western America, it seems desirable that the collection of varieties of this class now at the Department be considerably increased. It is therefore the purpose to collect such varieties as show desirable qualities and test them in pots in the greenhouse, not only to afford material for studying the sorts, but in order that a supply of wood for grafting may be easily available.

ARLINGTON EXPERIMENTAL FARM.

WORK OF THE YEAR.

LOCATION AND CHARACTER OF THE FARM.

The work of the Arlington Experimental Farm is conducted under the office of the chief of Bureau, with Mr. L. C. Corbett in direct charge. The farm is that portion of the former Robert E. Lee estate between the Arlington National Cemetery Reservation and the Potomac River. It can be reached by either of two lines of electric cars in twenty minutes, or by carriage.

The plot set aside for experimental use consists of some 400 acres of rolling land, made up chiefly of a clay loam, underlaid at a depth of 3 to 5 feet with an impervious clay subsoil, except the tops of the knolls, which consist largely of gravel. As a whole, the land lies well for the purposes to which it is to be devoted. In mechanical condition, it is all that could be desired—it is easily cultivated, responds readily to good treatment, yet carries a sufficient amount of sand to allow of cultivation soon after heavy rains. In general, it is in a fair state of fertility, the more elevated portions alone showing a lack of available plant food; this, however, will be corrected by the use of green manures and mineral fertilizers before permanent plantings are made. The diversity in the surface provides suitable locations for the various fruits adapted to this latitude, as well as facilities for studying the influence of slight elevations upon frost zones.

Since this parcel of land came under the control of the Department it has been thoroughly grubbed, all brush, briars, and tree growth having been removed, thus fitting the ground for the work of draining and cultivation.

DRAINING.

Several large streams of water reach the boundary of this property from the Arlington National Cemetery. These streams are too large

to be carried either in drain tile or large-size sewer pipe, and accordingly open ditches have been dug to serve as mains for these streams and to carry off the flow from tile drains rendered necessary by the great number of springs which are at present near the foot of the slope of the hill, particularly in the southwestern part of the farm. In order to drain this springy land and fit it for cultivation, some 10,000 feet of 3-inch and 4-inch drain tile have been laid. In carrying on this work it has been the object not only to carry off superfluous water, but to do the work in such a manner that the soil would be aerated and sweetened.

BUILDINGS.

A shed which serves the purpose of stable and tool room has been erected. There are no other structures of any description on the place.

CULTIVATION.

Plows were started in May, and some 40 acres have been prepared and seeded with cowpeas.

PLANS FOR FUTURE WORK.

It will be the aim to develop the Arlington farm into a high-grade experiment station for the purpose of propagating, testing, and studying fruits, vegetables, grains, and other crops brought to the attention of the Department. Besides investigating the needs of the soil with reference to the growth of fruits and vegetables, plots will be provided for the use of the various branches of the Department carrying on work in connection with plant diseases, insect attacks, etc. The Department has long felt the need of a collection of fruits, vegetables, and other plants, where experiments of this nature could be conducted, and one object of this work will be to provide these facilities as rapidly as possible. Within recent years a great many valuable seeds and plants have been sent to the Department, which, owing to lack of proper facilities for handling and growing, have been lost. All such seeds and plants will be tested in a preliminary way on the experiment farm, and all those that are found valuable will be disseminated where they give promise of succeeding. It is planned to do this work largely through the State experiment stations and through private individuals who have shown an interest in such special investigations.

In cooperation with the office of the Agrostologist, areas for testing the uses of various new forage plants will be set aside; and in order to facilitate the work in plant pathology and physiology, commercial fruit plantations will be maintained in which hybrid and cross-bred sorts will be tested, diseases treated, and food requirements studied. In order to obtain these results several years will be required. Buildings must be erected, and the working force of unskilled workmen must gradually be changed into a force of experts.

EXPERIMENTS IN PRODUCTION OF TEA.

WORK OF THE YEAR.

The experiments in the production of tea have been conducted, as heretofore, at "Pinehurst," Summerville, S. C., under the direction of Dr. Charles U. Shepard. The work during the year has been mainly directed toward the cheapening of the cost of production, the

improvement of the quality of the product, and the determination of the relative adaptability of the various sorts of tea for profitable cultivation in this country. In order to satisfactorily carry out this line of work, it became necessary to clear and put in suitable order considerable tracts of land for the extension of the experiment gardens. This has been done to the extent of about 12 acres, three-fourths of which have been finished and planted in tea. An additional 5 acres had been previously prepared, but the imported seed with which it was designed to plant it failed to germinate. Work is now being done on the preparation of 3 or 4 acres more. On the completion of this work it is intended to stop further extensions. This accession of practically 20 acres of land is designed for testing the feasibility of dispensing with artificial enrichment, the cost of which has constituted 15 to 20 per cent of the total expense of tea production. It is also planned to utilize the ground to some extent for cultivating imported varieties of tea of acknowledged worth. Until recently all of the "Pinehurst" gardens had been stimulated with artificial manuring. During the year a number of consignments of oriental tea seed were received, but owing to the long time necessary in transporting this seed much of it failed to germinate. The receipt of this seed has enabled the Department to establish four tea gardens at "Pinehurst," two of which are chiefly from seed from 2,500 feet and one each from 4,000 and 5,000 feet, respectively, above sea level. Of all the seed imported, that obtained from Darjeeling, in British India, produces the largest, surest, and most valuable tea crop at "Pinehurst." The crop of tea from the gardens this year will aggregate about 4,500 pounds, which is a slight gain for the whole estate over any previous year. It further demonstrates the fact that the plants which were so severely cut down by frost in the phenomenal freeze of 1895 have entirely recovered.

During the year special attention has been given to the development of machinery to aid in handling the tea. It becomes apparent as the work progresses that machinery will be absolutely essential in order to compete with the cheap labor of the Orient. Special machines used in the tea factories of the British colonies have been procured during the year and found to work very satisfactorily. As a result of the improvement in mechanical equipment the quality of the tea has been uniformly better, which is a very encouraging and promising result. Aside from the advantages already enumerated to be secured from the use of machinery, measures of equal importance are to be noted—as, for example, the elimination of possibilities of uncleanliness, and even of disease, from the hands of persons who handle the tea. Very satisfactory results have been obtained during the year through the introduction of the "rotary witherer." The mechanical manufacture of black tea has been in extensive use for several years, but only recently has that of green tea been seriously attempted. It has seemed all the more desirable, as this country is the chief consumer of that commodity; but so long as its preparation was entirely by hand its profitable production in the United States would have remained impossible. This new machine, which was invented by Dr. Shepard, has successfully overcome many of the difficulties of handling tea, and has paved the way, in conjunction with already supplied rolling, sifting, and dyeing machines, for the manufacture of green tea in a clean, cheap, and uniform manner. By means of the machine invented by Dr. Shepard a sterilization of the solvent ferments of the tea leaf is effected, so that its oxidation is reduced

to a minimum. Dr. Shepard has very generously arranged to patent this machine in the name of the Government, and will offer it through the Department to future American tea makers without royalty or restriction.

During the year the experiments in irrigation were continued, with encouraging results, although an accident to the main supply of water temporarily interfered with the extension of the work on a large scale. The experiments in sheltering tea from the direct sunlight have shown that the product obtained in this way is of a very much higher quality, but that the production was slightly decreased. Further work along this line is necessary to prove the profitable features of the investigation.

The expense of the work conducted by Dr. Shepard has been, in large part, borne by himself, and as a result of his efforts he has now at "Pinehurst" about 100 acres in tea, a well-equipped factory capable of turning out about 150 pounds of dry tea daily, and a disciplined force of tea pickers and factory hands. This well-conducted establishment, to the building of which Dr. Shepard has given some of the best years of his life, is now in position to serve as a model and school of instruction in the industry to which it is devoted.

PLANS FOR THE FUTURE.

In order to extend the work of tea production in the United States it will become necessary to establish seed-bearing groves in different parts of the Southern States. This is essential from the fact that better seed can be obtained from such groves than from the much-pruned and leaf-plucked commercial tea gardens. By means of a few acres of widely separated tea groves an abundance of tea seed of distinct character might be raised for the supply of future American gardens. As rapidly as the means will permit, it is planned to train young men (graduates of agricultural colleges) in the matter of tea production and to extend the work to different parts of the South where climate, soil, and labor give promise of success. There is much yet to be done in determining the best methods of handling tea, and for this reason it is believed advisable to secure, if possible, the services of a competent tea expert. Steps are being taken to this end, and it is hoped to have such an assistant at an early day.

SEED AND PLANT INTRODUCTION.

WORK OF THE YEAR.

On March 1, 1901, Mr. Jared G. Smith, who for a year past had been conducting the work, was appointed special agent in charge of the Hawaiian experiment station, at Honolulu, and Ernst A. Bessey was transferred from the Division of Vegetable Physiology and Pathology as assistant in charge. This report has been prepared by Mr. Bessey.

During the year 1900–1901 the number of importations of seeds and plants by the Office of Seed and Plant Introduction was about 1,614. The actual number of varieties is less than this, for many varieties were imported a number of times and from several different localities. A large part of these importations has been distributed to experiment stations and to a few private experimenters. As far as possible, seeds of the more important tropical and subtropical plants, especially those received in small quantities and those whose value is still problemat-

ical, have been planted in the Department greenhouses. It was also attempted to keep a sufficient number of every importation of live plants or cuttings, or, if the importation was small, the whole number, to furnish next year a larger number for distribution, besides preventing any danger of losing the whole importation, as might occur if the cuttings arrived and were sent out at an unfavorable season of the year. Many live plants and cuttings are not in the best condition after a long voyage, and it is advantageous to keep them where they can receive good care before sending them out.

During the year there have been four explorers collecting plants from foreign countries. Mr. M. A. Carleton, upon the completion of his work on the jury judging cereals at the Paris Exposition, went to Russia and obtained a quantity of macaroni wheat, and also of the hard red spring and winter wheats especially suited for cultivation on the Great Plains. Mr. G. D. Brill, an American citizen, for some time previous a resident of Wuchang, China, made a collection of seeds and plants in China, mainly in the Yangtse Vall y. A large number of pear, apple, and peach trees collected by him were dead when they reached Washington, having been delayed in transit. Mr. Brill's work was considerably hampered and his proposed itinerary very materially changed by the Boxer outbreak.

The main explorations of the year were those conducted by Mr. David G. Fairchild. In September, 1900, he was sent to Germany and Austria, especially to obtain hops and barleys, but also with instructions to obtain anything else of value that he might observe. Later he was instructed to proceed to Greece and Egypt. The last two months of the fiscal year were spent by him in Algeria, making arrangements to obtain some of the best varieties of Algerian macaroni wheats and Algerian forage plants. In this work he was ably assisted by Mr. Carl S. Scofield, assigned for that purpose temporarily to this office.

As in previous years, this office has cooperated with various branches of the Department in the matter of obtaining seeds and plants for various purposes. In cooperation with the Division of Chemistry, the purchase and distribution of sorghum and sugar-beet seed were undertaken. These were sent to the experiment stations in the States suited to their culture, as determined by the observations made by the Division of Chemistry, and were also distributed in those States through Senators and Representatives. A considerable quantity was also sent out on personal application, and toward the end of the planting season the remainder of the seed was distributed to the crop reporters and county correspondents by the Division of Statistics. In cooperation with the Pomologist, a large collection of apple and plum trees was obtained from Europe, and in cooperation with the Pomologist and the Pathologist and Physiologist, a collection of apple trees and scions of resistant varieties was obtained from Australia for experimental work against root aphis and root rot, respectively. In the introduction of macaroni wheats the office has worked in cooperation with the Office of Vegetable Physiology and Pathology, the wheats having been obtained by Mr. M. A. Carleton, cerealist of that office.

As provided by the act of Congress making the appropriation, the seeds and plants imported have, to a large extent, been sent to the experiment stations for trial. In many cases, instead of sending direct to the stations, the importations were sent to parties desig-

nated by the stations. The attempt has been made in every case to put the plants in parts of the country thought to be probably fitted for their growth, and they have been given as wide a dissemination as possible. It has been the attempt, moreover, not to send seeds and plants to people unknown to the Department or to the experiment stations unless it is apparent that they are able to report intelligently upon the experiment.

In two cases, namely, macaroni wheat and Turkestan alfalfa, where it has been shown that these importations are of great value, contracts have been entered into with several parties for growing seed, these to be purchased by the Department, subject to action of Congress in appropriating money available therefor.

The more important introductions of the past year are mentioned below.

In Bohemia Mr. D. G. Fairchild obtained several of the best varieties of hops. It is well known that the American hops are far inferior for brewing purposes to some of the Bohemian varieties, and several thousand cuttings of the latter were accordingly obtained, among them the Saaz, Semsch, and Tettnang varieties, and were placed, through the cooperation of the experiment stations, with experienced hop growers, mainly in the States of New York, Washington, Oregon, and California. At the same time Mr. Fairchild obtained a quantity of the best varieties of brewing barleys, particularly the Hanna barley. These, too, have been distributed where barley growing is practiced especially, and ought to prove of great money value to the country.

The little town of Malin, in Bohemia, is famous all over Europe for the especially fine horseradish which is produced there. Mr. Fairchild was fortunate enough to be able to obtain a large number of cuttings of its best variety, and these have been distributed to horseradish growers in the country. It is too early yet to determine how valuable this importation will prove to this country.

From southern Austria and Greece a few cuttings of a number of the more valuable wine and table grapes were obtained. When these are grown in sufficiently large numbers in this country they ought to prove a valuable addition to our already considerable list of such grapes. Probably the most valuable importation of these was that of about 3,000 long cuttings of the Greek corinth from Panariti. These have been placed in parts of California and Arizona, where the climate is similar to that part of Greece from which they came; and if they prove to bear as well in this country as in their native home they will be of exceedingly great value. At present we import hundreds of thousands of dollars worth of corinths, or Zante currants, as they are called, and if they can be produced successfully in this country the importations would be greatly decreased.

Other importations of less importance from Greece include oranges, seedless lemons, limes, pomegranates, and the pistache nut.

In continuation of the importation of date palms, by which it was intended eventually to have growing in Arizona and southern California all the good varieties of dates in the world, Mr. Fairchild obtained the best varieties of dates of the Delta of the Nile, in Egypt. He also arranged to obtain palms of the best varieties grown in other parts of Egypt.

A large collection of the most important leguminous forage crops of Egypt was procured for use in the extensive experiments with these plants to be undertaken in this country the coming season. A

considerable amount of Egyptian cotton seed was obtained from different parts of Egypt for use in breeding for improved quality and for resistance to root disease. A quantity of the seed of the Berseem clover was also obtained, but not enough for a general distribution.

Among the cereals of more or less importance that were imported by the office during the year may be mentioned the North Finnish Black oats from Finland and Sixty Day oats from Russia, both especially suited by their shortness of season for Alaska and regions of short growing period, and a special strain of Ligowo oats, suited for growth in the Northern States. From Sweden there was also obtained a number of the better brewing barleys especially adapted for shorter seasons.

Importations that will prove of value for limited localities are a number of figs and caprifigs which will be valuable to California, and a considerable quantity of seed of the Siberian crab apple, which latter plant will, it is thought, be especially valuable as a stock for the apple to prevent winterkilling.

FUTURE WORK.

For the coming year, it is planned to obtain new varieties of rice from Japan, China, the Philippines, and India, in the attempt to extend the rice industry farther North, and to make it possible for the small farmers in the interior of the Southern States to obtain a rice that will prove valuable for stock-feeding purposes. In connection with this work, Dr. Seaman A. Knapp, of Lake Charles, La., is making a trip to the countries named.

It is the intention to continue the work with cereals, particularly the macaroni wheats. For this purpose several hundred bushels obtained by Mr. Fairchild in Algeria will be made use of, as well as a large quantity to be obtained in Russia. That now being grown under contract will also be distributed. It is hoped the coming year to be able to demonstrate to the farmers the practicability of growing this wheat, and thus to get its culture generally established. Already in North Dakota and South Dakota farmers are going into this matter quite extensively.

Special attention will also be paid this year, mainly in the South and on the Pacific coast, to the introduction of new forage crops, principally leguminous plants. There is great need in these regions for a variety of such crops that can be used both for forage and as green manure.

The date industry will continue to take some time and study. Desirable varieties will be imported when found, and possibly an explorer sent to Algeria to study certain features of date culture.

A nut of great value in the Mediterranean region is the pistache. A few scions of this have already been imported, but it is intended to prosecute the introduction vigorously. The nut is well worth culture in this country, and will prove very valuable when it is once established. Attention will also be paid to the plants especially adapted to our tropical possessions. Active cooperation will be maintained with the experiment stations in Porto Rico and Hawaii, and assistance will be given, as far as practicable, to agricultural work in the Philippines.

In cooperation with the office of the Pomologist it is intended to introduce new fruits into this country wherever such may be found desirable.

Fiber plants, especially cotton, will be introduced in cooperation with the office of the Pathologist and Physiologist and the office of the Botanist.

Besides the above-mentioned lines of work it is the intention of this office, as far as possible, to import seeds and plants in direct cooperation with the experiment stations, where the latter are making special studies of certain lines of work.

The increased interest in plant breeding all over the country has led to the need of obtaining small quantities of a great many varieties in the attempt to obtain desirable qualities which can be bred into the new varieties. The Office of Seed and Plant Introduction is especially favorably equipped for making such importations, and will endeavor to keep in close touch with plant breeding throughout the whole country.

The changes in the general plan of handling all the work connected with seed and plant introduction have already been discussed, and need not be entered upon in detail here. Suffice it to say that the division of labor effected by the change, and the opportunities afforded for concentration of efforts on special crops, have already produced good results.

CONGRESSIONAL SEED DISTRIBUTION.

In accordance with an order issued by you on April 24, 1901, all matters pertaining to the final settlement of the Congressional seed distribution for the fiscal year ended June 30, 1901, were placed in the hands of the chief of the Bureau. At that time the work of distributing the seeds was practically finished, but steps were at once taken to carry out your instructions in regard to closing up the work. It was found that the appropriation for the purchase and distribution of valuable seeds and plants for the fiscal year ended June 30, 1901, was $170,000, and that the following allotments had been made of this sum:

For the purchase and distribution of vegetable, flower, cotton, tobacco, and lawn-grass seed, through the New York Market Gardeners' Association	$108,874.12
For the purchase and distribution of valuable foreign seeds and plants, through the Office of Seed and Plant Introduction	20,000.00
For the purchase and distribution of grapevines, strawberry plants, and bulbs, through the Office of Experimental Gardens and Grounds	5,000.00
For the purchase and distribution of sugar-beet, sorghum, and other miscellaneous Congressional seed	3,125.88
For miscellaneous labor and material, to be expended in the city of Washington	33,000.00
Total	170,000.00

The details of the work connected with the distribution of valuable foreign seeds and plants, and the purchase of grapevines, strawberry plants, bulbs, etc., have already been given under the reports on the work of the Office of Seed and Plant Introduction and the Office of Experimental Gardens and Grounds, respectively. As already noted, the distribution of the vegetable, flower, cotton, tobacco, and lawn-grass seed was made under a contract with the New York Market Gardeners' Association. Owing to various circumstances, the work carried on under this contract was not entirely satisfactory, and for this reason a full settlement has not as yet been effected. When matters now pending are definitely settled a full and complete report will be made on the entire work.

PLANS FOR THE FORTHCOMING DISTRIBUTION.

Owing to the fact that the contract for the fiscal year ended June 30, 1902, had been awarded when the seed work was turned over to the Bureau of Plant Industry, it was impracticable to make a number of important and necessary changes in the work. Some modifications have been brought about, however, and it is believed that these will lead to improvement in a number of directions.

The contractor this year is The Henry Phillips Seed and Implement Company, of Toledo, Ohio, who will put up and send out the vegetable and flower seeds only. All other seeds and plants will be handled by the Department, as it is believed better results can be obtained in this way. In connection with the work done by the Department, the distribution of seeds of grasses and forage plants will receive special attention. Aside from the usual distribution of lawn-grass seed to Senators, Members, and Delegates in Congress, it is planned to send out, on Congressional orders, five or six special forage crops which are comparatively new and which give promise of being of value for certain regions. In order to best effect the distribution of this seed the country will be divided into several districts, and a particular forage crop sent where it is likely to prove most valuable.

Another innovation will be made in the matter of distributing cotton seed. Instead of the usual practice of sending out small packages of seed of common forms already well known, an effort will be made to secure for distribution promising new sorts adapted to special regions of the South. For several years the Department has been engaged upon an investigation of cotton with a view to securing varieties better adapted to certain regions and more resistant to diseases. Already excellent results have been obtained in this work, and it is planned to eventually distribute seeds of the new sorts in order to give them widespread dissemination. The cotton seed this year will be sent out in larger quantities than before, for the reason that better results will be obtained by encouraging the planting of sufficient seed to determine its value. Already definite arrangements have been made for securing most of the seed, and it is believed much benefit will result by its distribution.

In the distribution of tobacco seed arrangements have been made to cooperate with the Bureau of Soils. It is planned to send into each district only the varieties likely to succeed there. In order to secure only the best seed for this purpose arrangements have been made for a special selection of the seed, and each Senator and Member living where tobacco is grown will have placed at his disposal a sufficient number of packages of selected seed to give the varieties a thorough trial.

Under the direction of the Secretary, arrangements have been made to send out this year, for the first time, a number of choice young trees, the object being to encourage a love for trees and all that the planting and care of them involves. No attempt will be made to send out large numbers of any one kind, but it is believed that the distribution of a few of the little-known sorts, particularly the rarer nut trees, will be of much value, especially if the trees themselves are accompanied with instructions as to their planting and care.

Aside from the special matters noted above every arrangement has been made to secure seeds of high quality, and to have every variety properly packeted, labeled, and sent out promptly.

SPECIAL RECOMMENDATIONS.

In addition to the recommendations and suggestions already given under the reports of the executive officers, special attention is called to the necessity of pushing vigorously a number of important lines. In the work carried on by the office of the Pathologist and Physiologist, important studies should be taken up of various fungi and bacteria which affect either detrimentally or beneficially the flavor, odor, wholesomeness, and market value of various agricultural products. It is now largely an accident whether many of these products are good or bad, as it depends largely upon what organism or ferment happens to gain the ascendency during the particular stages of manufacture. If the question were reduced to the basis of exact knowledge, it would be possible to make American products that could compete in quality and price with the very best to be had anywhere in the world. Requests have been received from flax growers for pure cultures and informtion concerning the organism which brings about the retting of flax. In this country, at least, the retting of flax is a mere hit and miss business, and the product may be good, indifferent, or worthless; but if the manufacturer could start with pure culture inoculations of a given organism serious losses would be avoided and a uniform and high-grade product obtained. Studies of the fermentation processes which go on in the silo should be taken up, as well as those which have to do with bread making and the softening of pickles, olives, etc.

Another line of important work which will require special attention is a study of the diseases of forest trees and construction timber. Attention has already been called to the importance of this work, but to enlarge and push it as requirements demand will necessitate additional funds.

In the botanical investigations and experiments it is highly necessary to push as rapidly as possible the important work in the methods of sowing clover and other field seeds, in order to secure a standard under various conditions of soil or climate. The work on the methods of treating and preserving seeds should also be pushed without delay. Problems along these lines arise with special urgency in respect to the seed of cereals, sorghum, soy beans, and vetches. Considerable work must be done before we are in a position to explain the cause of the deterioration of seeds and to suggest preventive measures. It is also highly important to extend as rapidly as the means can be secured investigations on tropical crops. Already the Department is receiving many inquiries as to the best crops for our tropical possessions, and special funds will be required to extend the work so as to answer these inquiries. The important work inaugurated last year in this office on the study of the loss of grain in export shipments also needs funds for rapid extension. To carry on these and other important lines of work in the office of the Botanist, increased appropriations have been estimated for.

Some of the most important problems having to do with agriculture and agricultural development in this country are those pertaining to the grass and forage-plant investigations. The Agrostologist is making a strong effort to push this work as rapidly as funds will permit. To broaden the investigations in a way commensurate with their importance will require additional funds, and it is urgently recommended that these be allowed. Of the special work in this connection, it may be said that it is highly important that a thorough investigation be

made of the forage plants and forage conditions in the West at different seasons of the year, and particularly in the autumn, when the range is at its best and the opportunity is excellent for collecting and studying the grasses and forage plants. Too much attention can not be paid to the native grasses which are already adapted to unfavorable conditions of ordinary vegetation. The work that has been done at Abilene, Tex., and the work that is now being carried on at Tucson, Ariz., gives assurance of remarkable possibilities in the restoration or improvement of the great cattle ranges and pastures of the West by judicious management and reseeding.

One familiar with the well-grassed meadows and hillsides of the Eastern and Middle States can form little idea of the utter desolation and barrenness of hundreds of thousands of square miles of territory in the West that formerly supported untold numbers of fat cattle. This condition has come about through overstocking the ranges and mismanagement of the land. The experiments already made lead us to believe that these now desolated areas may be restored to their former productiveness. Our knowledge of the habits and capabilities of our native grasses and forage plants makes this assurance doubly sure, for in them we will find the means of again covering the ground with nutritious herbage. If the land is again regrassed the precipitated moisture will be preserved and prevented from running off in torrents and carrying with it the best plant food in the soil. To us it appears that Government range reserves would have an importance fully equal to the forest reserves, about which there is no question, and if properly handled might play even a greater part in the conservation of the precious moisture of the semiarid regions. It is a work which affects the entire live-stock interests of the country, and its demonstration in such States or Territories as may be selected for the purpose will enhance the value of the range lands of the entire West.

In the pomological investigations very encouraging results have already been obtained in the important new work inaugurated in the matter of extending our fruit markets. It is believed that a promising field is open for the fruit growers of this country if certain important principles can be worked out and understood, especially those pertaining to the best means of handling, storing, and shipping the fruits. The markets of Europe are open to us, and there is no reason why we should not greatly extend our market possibilities by taking advantage of the demand for good fruits abroad. To accomplish this, however, will need careful investigations in order to enable our fruit growers to know definitely the best means to adopt in order to get their product across the water in good condition. These are some of the new problems being pushed in the pomological work, and for the extension of which additional funds are required.

REPORT OF THE CHEMIST.

U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF CHEMISTRY,
Washington, D. C., July 24, 1901.

SIR: I beg to submit herewith a statement of the work carried on in the Division of Chemistry for the fiscal year ended June 30, 1901, with plan of work in the Bureau of Chemistry for 1902 and proposed work for 1903.

Respectfully,

H. W. WILEY,
Chemist.

Hon. JAMES WILSON, *Secretary.*

WORK OF THE YEAR.

NEW WORK.

The most important new work during the year was the establishment of a laboratory for the investigation of the physical and chemical properties of the materials used in building roads. This work has both a high scientific and practical value in the construction of good roads.

It is a well-known fact that the agricultural value of farm products depends largely upon the accessibility to markets. Accessibility to a market is not judged alone by distance in miles from the place where the crop is grown; it is judged rather by the facilities and cheapness of transportation. New York City is a market which is reasonably accessible to the West India Islands, on account of the cheapness of transportation by water. It is, however, judged from a market point of view, at a great distance from many places in New York State, in the Adirondacks for instance. Farms which lie within a few miles of a market are often so difficult to reach as to render it almost impossible to realize any profit on the products of their fields. The building of good roads is, therefore, directly related to the progress of agriculture.

It is perfectly evident that many millions of dollars have been wasted in the building of roads because the nature of the material used for surfacing has not been known. The surface of a road must be hard enough to resist the ordinary wear and tear of traffic, and should be composed of materials which, when reduced to powder, have a certain cementing value which prevents the comminuted particles from being removed by wind and water. The character of the materials used in a road must also be adapted to the kind of traffic to which the road is to be subjected. A roadway constructed for the light carriage traffic of a city and its suburbs should be composed of quite different materials, placed in a different manner, from a road over which heavily loaded wagons are to be drawn.

All these problems connected with the nature of road materials are of a physical and chemical nature. It is true they can all be worked out by actual experience, but experience in this case is extremely costly. The most certain and economic way of solving these problems is in the laboratory. There small quantities of material can be subjected to all the tests of stress, friction, and cementation to which they would be subjected if actually placed in a road for use. Thus, with only a very small quantity of material, had at a comparatively low cost, the actual value of the material can be ascertained with a high degree of accuracy.

For the purpose of studying these problems, a laboratory, as has been stated, was established in the basement of the chemical building, in which a large part of the machinery necessary to the testing of road materials has already been installed. No chemical work in connection with the structure of road materials, in relation to their surfacing and cementing properties, was undertaken during the year, by reason of a lack of chemical force. Full preparation, however, was made for the beginning of this interesting part of the investigations during the present fiscal year.

INVESTIGATION OF THE INFLUENCE OF ENVIRONMENT ON THE SUGAR CONTENT OF THE BEET.

Since the beginning of the investigation of the chemical composition of sugar-producing plants by the Division of Chemistry, now more than a quarter of a century ago, the great influence of environment, that is, soil and climatic conditions, upon the sugar content of the beet has been recognized. By reason of the extreme variation in environment of this nature in different parts of the United States, it is evident that this influence is more pronounced in the case of the beets grown in this country than in those grown in Europe. In a general way, for the last fifteen years the Division had been able to point out with a reasonable degree of accuracy the areas in the United States which, in the light of the investigations which had been conducted, were best suited to the growth of sugar beets with a maximum content of sugar. These widely extended investigations, covering a period of nearly thirty years, formed a substantial basis from which to begin in a more systematic way the practical study of the influence of environment.

The object in view was to determine, first of all, the exact force of environment, and, second, by analysis of the various factors of environment to determine those which were most active either in increasing or diminishing sugar content.

It is evident that in a study of this kind the Division must have recourse to the collaboration of other Bureaus and workers. In the present instance the Division was most fortunate in securing the active cooperation of the Weather Bureau in determining as nearly as possible the conditions of the weather during the periods of growth of the experimental fields. It was also fortunate in securing the active and hearty cooperation of a number of the agricultural experiment stations, which were selected with a view of securing as widely different conditions of environment as could be obtained. The stations cooperating in this work were those of Indiana, Iowa, Kentucky, Michigan, North Carolina, Utah, Virginia, Wisconsin, and the two stations in New York. The plan adopted for the work was as follows:

A high-grade beet seed of uniform character was distributed to each of the collaborating stations. Portions of the same lot of seed

were also planted at the experiment station of the Department on the island below Long Bridge, District of Columbia. Each collaborating station kept a complete field record of its operations, including the method of preparing the soil, time of planting, character of cultivation, and time of harvest. The observers of the Weather Bureau, at or near the points at which the experiments were made, kept a regular, full record of precipitation, temperature, and hours of sunshine. Analyses of the beets grown were made both at the collaborating stations and in this laboratory. Since the beets were all produced by seed of the same kind, grown in the same locality and of the same quality, and since the conditions, aside from environment, were practically the same in all cases, it is evident that any variation in the chemical composition of the beets produced must have been due to soil and seasonal influences.

The analytical data were tabulated, and from these data descriptive charts were drawn, three in number. In each of the three charts the content of sugar was taken as the basic line of illustration. The collaborating stations, together with the station at Washington, D. C., were arranged in the order of the sugar content. The first chart represents by platted curves the percentage of sugar in the beets, the latitude of the collaborating stations, the hours of sunshine in a percentage of the total possible sunshine, and the distribution of sunshine by months, that is, the number of clear days calculated on a scale of 30.

The second chart contains, platted in like manner, the sugar in the beets in percentage, the total rainfall on a scale of inches, the altitude, being the distance of the collaborating stations above the sea level in feet, and the distribution of rainfall by months, scale in inches.

The third chart contains the percentage of sugar in the beets, the coefficient of purity of the juice of the beets on a scale of 100, the temperature during the growing months, scale in degrees Fahrenheit, and the average length of the days, scale in hours and minutes.

These charts, with the accompanying text, are believed to present the first really systematic statement of the effects of environment upon the sugar beet which has ever been published in this country. This is said without casting any reflection whatever upon the previous publications of this Department on the same subject. It must not be forgotten, however, that the previous publications were merely incidental to the principal end which was kept in view, viz, the determination of the sugar content of the beet over wide areas of distribution. A bulletin containing the chemical data, descriptive text, and the graphic charts above mentioned will soon be published.

INFLUENCE OF ENVIRONMENT ON THE GLUTEN CONTENT OF WHEAT.

Under authority of Congress, the investigation of the influence of environment on the gluten content of wheat was conducted through the collaboration of experiment stations in different parts of the country. The stations engaged in the work were those of California, Colorado, Indiana, Kentucky, Maryland, Michigan, and Missouri. The wheat which was sown at these various stations was all of the same kind. The chemical composition of this wheat was carefully determined before the distribution of the seed. Samples of the wheat grown in the different stations were sent on for analysis and the analytical data were obtained in the same manner as in the original

sample. The results were of the most surprising nature, showing that even in the course of a year the influence of environment was so great as to cause a variation from the original content of gluten of 50 per cent or more. In most instances the content of gluten was less than in the original seed. In one or two cases it was greater.

In addition to the study of the gluten content, as has been mentioned, a complete analysis of the wheat was made; sections were also made for microscopical examination for the purpose of showing any alteration in the character of the grain itself. When the extent of these variations has been carefully determined and the causes which produce the variations ascertained, in so far as possible, valuable practical deductions can be drawn which will help scientific farmers to a certain extent to control the content of gluten as well as of other valuable materials in the crop. Since for bread making and macaroni making the content of gluten is of the utmost importance, it is evident that the value of a wheat in the market can be greatly increased if some practical method of maintaining and increasing the gluten content can be devised.

INVESTIGATION OF INSECTICIDES.

In collaboration with the Division of Entomology, the determination of the chemical constituents of the insecticides sold throughout the United States was continued and completed, in so far as we are able to secure the samples. It is believed that we have secured, through the collaboration of the Division of Entomology, a sample of every insecticide which is made in any quantity in the United States. Some remarkable facts have been brought out in this investigation. The most important to the farmer, from the practical point of view, is that many of the so-called insecticides contain only a mere trace, or none at all, of insect-killing drugs or poisons. In many others where poisonous principles were present we found them so diluted and adulterated with inert materials as to greatly lessen their value for the purpose for which they were sold, without correspondingly diminishing their price to the consumer. It is not right that a farmer should risk his potatoes, tobacco, or other crops subject to insect ravages by reason of the worthless character of the insecticide which he purchases. While there is no National law regulating the subject, it is believed that an investigation of this kind will awaken the interest of farmers throughout the country to the necessity of at least enacting State laws for their local protection, eventually leading to a National law which will make the State laws more effective and the protection to the farmer more certain.

It is, of course, evident that the only object of adding inert substances to insecticides is to increase weight without correspondingly diminishing the selling price. There can be no objection to the diluting of a powerful insecticide with some inert substance for the purpose of rendering its action less vigorous, and thus preventing its injuring the crop. In such a case, however, every package of insecticide as sold should bear a plainly printed label on which the character of the diluent and the amount thereof employed are distinctly set forth. The purchaser, then, would not be the victim of a fraud, and if he should not care to purchase a cheapened article, thus described, he could simply invest in other and more powerful remedial agents.

The results of this investigation have been prepared for publication in two forms: One, a Farmers' Bulletin, in which some of the general principles relating to the composition of insecticides are set forth,

with illustrations of adulteration given by numerous citations from the work done in the Division; the other giving in more technical form full details of the work, describing the methods employed and the analytical data obtained and soon to be submitted as one of the technical publications of this Bureau.

SOIL STUDIES.

The studies of soils, in relation to their composition as affecting plant growth and the nature and character of the microorganisms which they contain, authorized by Congress, have been pushed steadily forward. The magnitude of this work has been described in previous reports. It is only proper to add, however, a brief statement of what was done during the year.

After five years of experimentation, the soils were thoroughly sterilized so as to destroy adventitious ferments, and the proper ferments were added to the sterilized soils by seeding the pots with some solution of soil taken from a very fertile spot. The pots were thus prepared for a new series of determinations which it is proposed to carry forward during the coming five years.

The data of the first five years have now been collected and are ready for publication in the following particulars:

(1) The chemical composition of the soils, as determined by all the standard methods.

(2) The available plant food in the soils as determined, first, by all the ordinary chemical methods; and, second, by the quantities of plant food removed from the soil during a period of five years, with two crops each year, making a total of ten crops.

(3) The relation of available fertility in the soil to the production of crops, studied by a new method devised in the Division, whereby the soil is subjected to the solvent action of a very weak solution of hydrochloric acid, at a temperature of 40°, for a definite period of time.

This late method of treatment has been more successful in establishing the relation between the availability of plant food in the soil, as determined by chemical analysis, and the actual crop produced than any other method now in vogue. The data obtained in this way so far relate solely to the availability of the phosphoric acid and potash. For the purpose of including the nitrogen content of the soil in these investigations a new series has been commenced, in which all three of the elements mentioned, viz, phosphoric acid, potash, and nitrogen, will be taken into consideration in the discussion of the problem.

The importance of this investigation will only be fully appreciated when, in case the laboratory data are borne out by practice in the field, it can be shown that a full and speedy soil survey, from a chemical point of view, can be made of a field without the elaborate and time-consuming investigations which heretofore such studies have required.

COMPOSITION AND ADULTERATION OF FOODS.

During the year the chief part of the work done in this direction was in the investigation of preserved foods, preserved meats, especially canned meats of all kinds, and the delicatessen of animal origin kept in high-grade grocery stores. In order to have a solid scientific basis for these investigations, fresh meats were secured, their composition determined, and then the meats canned in the ordinary way. After a time the cans were opened and the meats they contained

subjected to chemical examination. By this method a direct comparison was secured between the great number of meat products examined and the original fresh products from which they were made. The amount of chemical work involved in this examination was of great magnitude, and the bulletin containing the data of this work will consequently be of a bulky nature. It is now ready for submittal.

An elaborate investigation was also made of the character of horse meat, with the object of determining whether or not it is sold surreptitiously in this country for beef and also to determine whether or not when mixed with other meats, as in the instance of making sausage, the parts derived from the horse could in any way be identified. The two obvious methods of procedure which would be naturally suggested in this case were followed, viz, (1) microscopic examination of the meat fibers and (2) determination of the chemical composition of the mixtures. To this end mixtures of horse meat with other meats in known proportions were made, converted into sausage, and afterwards given to the analysts without their knowledge of its contents for the purpose of determining whether or not horse meat was contained therein. The microscopic efforts in this line were futile, since it was not possible to discover with certainty the fibers due to horse meat in a mixture of that meat with certain other forms previously subjected to the vigorous action of the sausage grinder.

In the study of the chemical composition as a means of discriminating between horse meat and other kinds of flesh, more favorable results were obtained. The meat of the horse contains quite a large quantity of a sugar-producing substance known as glycogen. Other common edible meats, with the exception of the meat of the lobster, crab, and crayfish, contain only small quantities of this substance. It is evident, therefore, that a determination of glycogen in a mixture would be a valuable indication in regard to the origin of the meats therein in so far as the horse is concerned. When the elucidation of this problem was begun, however, it was discovered that none of the accepted standards of examination was satisfactory. It was, therefore, first of all necessary to develop, by modification and otherwise, a method of determining glycogen in horse meat which was reasonably accurate. This, happily, was accomplished, and we were then able to detect the presence of horse meat in a mixture, provided the amount thereof was not reduced to too low a percentage. Working with the greatest care, it is believed that as little as 10 per cent of horseflesh with beef can be detected with certainty by the methods used in this laboratory and described in full in the forthcoming bulletin above referred to.

Not only is it possible to use the glycogen content for the purpose of detecting a mixture of horse meat in sausages, but the iodin number of the fat is also valuable. The iodin absorption of the fat of horse meat is very distinctly higher than that of beef, when both are determined in the fresh state, and this is an additional evidence on which a discrimination between the two can be based.

In the case of smoked meats, however, this number is not so valuable, since it has been found that in the fat of beef after smoking, the iodin number is markedly higher than it was before.

INVESTIGATION OF IMPORTED FOODS.

Under renewed authority from Congress, the work of the investigation of the character of imported foods was carried on during

the year, and the reports of these investigations have been confidentially submitted to the Secretary of Agriculture. The value of the data which have been obtained in this way, however, is so great as to warrant the belief that their publication would be advisable. The scope of this investigation has been very broad, including wines and beers, dairy products, especially cheeses, salad oils, delicatessen of all kinds, preserved fruits, jellies, jams and marmalades, and, in fact, nearly every article of food imported. These data would be so valuable to the food chemists of this country and to food experts in general, if published, that I am led to recommend their collection into a form proper for publication as a bulletin of the Bureau of Chemistry.

INVESTIGATION OF FOODS INTENDED FOR EXPORT.

Congress has authorized the Secretary of Agriculture, through the Division of Chemistry, to inspect food products intended for export to foreign countries where chemical and physical tests are required of foods offered for sale. Unfortunately, Congress gave no appropriation for carrying this work into effect, and therefore it has not been possible to institute the control contemplated by the act. Full preparation, however, has been made for the inception and prosecution of this work whenever the funds are forthcoming, and as a preliminary step a careful study of the foreign laws regulating the sale of foods has been made. The results of this investigation were published as Bulletin No. 61 of the Division of Chemistry. Exporters of foods interested in knowing to what tests their exports will be subjected in foreign countries can ascertain them by applying to the Secretary of Agriculture for a copy of the bulletin mentioned.

CHEMICAL COMPOSITION OF WINES, CIDERS, AND OTHER FERMENTED BEVERAGES.

Work has been continued during the year, in collaboration with the viticultural associations of the country, in a study of the composition of American wines. This work was particularly opportune in consequence of the exhibition of a large number of standard American wines at the World's Fair in Paris. Not only were our own wine makers gratified, but the wine growers of Europe were somewhat astonished at the fine showing made by our wines in Paris. More than 90 per cent of all the samples exhibited received awards. When it is remembered that only about 40 per cent of the objects exhibited received recognition, this high number for our own wines is extremely flattering. Among the awards was a large percentage of gold and silver medals, and, in one instance, an American wine was marked the highest possible number below that which would have entitled it to the grand prize, viz, 18 on a scale of 20. Had it not been that the particular wine in question bore as parts of its label names indicative of foreign origin it is probable that it would have received the grand prize.

Not only the American still wines, but, what is more surprising, the American sparkling wines received very high awards. When it is borne in mind that the jury was composed almost exclusively of foreigners, having only two American representatives, and that there was a certain trade prejudice against American wines, this high rating becomes the more noteworthy.

In connection with this study a special agent of the Department was

commissioned to go into the wine districts of southern France for the purpose of studying particularly the methods of vinification employed and to ascertain whether or not any adulterations were practiced. A valuable report of the observations of this special agent is almost ready for publication.

Another special agent of the Department was commissioned to study the methods employed in cider making in England, France, and Germany, with special reference to the influence of the different ferments upon the chemical composition of the product. Large numbers of samples of these ciders have been analyzed in the Division in Washington, and a report of the special agent, together with a report of the chemical study, will soon be ready for publication.

The practical information in these reports will be of the greatest value to the wine and cider makers of our country in helping them to secure a product from the ripened fruits of a high grade and a greater market value than heretofore. In this way the chemical studies supplement the practical work of the orchardist and viticulturist by taking their product after the ripening of the fruit and showing in what way the best composition of the wines and ciders can be secured.

COLLABORATIVE WORK WITH DIVISIONS OF THIS DEPARTMENT.

In addition to the collaborative work mentioned above, the Division conducted extensive investigations during the year in dairy products for the Bureau of Animal Industry. For the Division of Vegetable Physiology and Pathology an extensive series of analyses of wheats used for the manufacture of flour employed in making macaroni was undertaken and completed. This work was supplemented with a chemical study of the macaronis themselves. All the data of these cereal investigations have been transmitted to the Bureau of Plant Industry, and I believe will soon be published.

COLLABORATIVE WORK WITH OTHER EXECUTIVE DEPARTMENTS.

The collaborative work with other Executive Departments of the Government continued during the year.

TREASURY DEPARTMENT.

In order to make the collaborative work more useful to the Treasury, the chief of the Division of Chemistry was, with the consent of the Secretary of Agriculture, appointed during the year by the Secretary of the Treasury as supervisor of sugar tests for the appraisers' laboratories at Philadelphia, New York, and Boston. In connection with this work a systematic check test of exchange samples of sugar was carried on in the laboratory of the Division during the year. The manual and clerical labor necessary to this work would be justly charged to the account of the Treasury, but so far it has been given by the Department of Agriculture without expense to the Treasury.

This work is of the greatest importance on account of the fact that the levying of duties on imported sugars is determined wholly, with the exception of high-grade white sugars, by the polariscopic test. The importance of having this correct and uniform is, therefore, at once apparent. The results obtained in the laboratory of the Division, with those secured in the various laboratories of the appraisers above mentioned, are compared monthly, and if any notable discrepancy is

discovered attempts are at once made to ascertain the cause of such discrepancy and to devise means for obviating it. The result of this collaborative work is that the various chemists in the appraisers' laboratories are working more and more upon a uniform plan and securing by far more uniform classifications than have ever heretofore been obtained.

WAR AND NAVY DEPARTMENTS.

During the year large numbers of samples of foods and supplies for the Army and Navy have been examined in the Division of Chemistry upon request addressed to the Secretary of Agriculture. Most of these examinations have been for food supplies, but many of them have been for clothing and other things necessary to the Army and Navy at home and in the Tropics.

It seems desirable that there should be some central laboratory of this kind where the various Departments of the Government can secure chemical services, and the equipment and scope of the work of the Bureau of Chemistry seems to indicate that it is here that such work will be principally done. This is the more probable on account of the hearty sympathy of the Secretary of Agriculture with the other Departments in their efforts to secure a proper chemical control of the foods and supplies which are demanded for the public service.

POST-OFFICE DEPARTMENT.

A number of investigations was made during the year for the Post-Office Department with reference to the composition of articles which it was desired to have forwarded through the mails and in the study of problems submitted by the Postmaster-General relating to the needs of his service. Among these may be mentioned the examination of inks, used not only in the service of the Post-Office Department, but by the Department of State and many other Departments of the Government. It is important that these inks should be plain, legible, and, so far as possible, indelible. Large numbers of such inks have been submitted to us by the Post-Office and State Departments. Their composition has been studied, the character of the imprints they made ascertained, and reports made in regard to comparative efficiency to the various Departments requiring our aid.

INTERIOR DEPARTMENT.

The Division of Chemistry continued its cooperation with the Interior Department in regard to the study of the composition of all the important springs on the Government reservation at Hot Springs, Ark. This work employed one of the chemists of the Division for the greater part of the fiscal year, and the salary and traveling expenses of this chemist were paid by the Department of the Interior. The general details of the results of the investigation have been reported from time to time through the Secretary of Agriculture, and it is believed that a full report on this investigation will be ready to go forward not later than the first of November.

COLLABORATIVE WORK WITH THE ASSOCIATION OF OFFICIAL AGRICULTURAL CHEMISTS.

The cooperative work with the Association of Official Agricultural Chemists has been prosecuted during the year as usual. All the

referees of the association sent samples to the Division for comparative determinations.

The annual meeting of the association was held, as usual, under the patronage of the Secretary of Agriculture. The proceedings of this meeting were published as Bulletin No. 62 of the Division of Chemistry.

PLAN OF WORK FOR THE FISCAL YEAR ENDING JUNE 30, 1902.

By act of Congress, the Division of Chemistry, on the 1st of July, 1901, became a Bureau. This change in name and status of the Division, however, did not in any way interrupt the character of the work already undertaken. It did, however, open the way to a much broader field of work in the way of collaborating with the various Divisions and Bureaus of the Department and with the other Departments of the Government.

SOIL WORK.

The investigation of soils, with relation to determining their chemical constituents available as plant food, will be continued in the line of work described in the first part of this report.

COMPOSITION AND ADULTERATION OF FOODS.

During the fiscal year this work will be directed chiefly to a study of infants and invalids' foods and to the adulteration of salad oils. It has been a matter of comment that alleged pure olive oils are imported into this country and sold at a price below the market value of the pure olive oils of California. The object of the study will be to determine whether or not the imported so-called olive oils are really pure.

In the case of infants and invalids' foods, an attempt will be made to study all the leading brands upon the market for the purpose of ascertaining, first, in the case of infants' foods, whether their composition resembles that of the natural food of the infant, and, second, in the case of invalids' foods, whether they contain the proper nourishment and in the proper form for the sustenance of invalids whose digestive organs are usually far below the normal standard.

INVESTIGATION OF SUGAR-PRODUCING PLANTS.

This work will be continued during the present fiscal year on the lines already referred to. The collaboration of the experiment stations in studying the effect of environment on the composition of the beet will be continued. Miscellaneous analyses of samples sent in by farmers throughout the country will be made. An experimental plot planted to several varieties of beets is growing at the Department's station on the island below Long Bridge, District of Columbia. A complete series of studies of this plot will be conducted.

Arrangements have been made with Capt. D. G. Purse, president of the Board of Trade of Savannah, for a systematic examination of the soils in southern Georgia and Florida on which sugar cane is grown for the manufacture of molasses, sirups, and sugars. Samples of these canes will also be forwarded for analysis during the harvesting season.

The presence of sugar in the muskmelon or cantaloupe is one of the

most desirable properties for table consumption. The excellence of these melons is usually judged by their sweetness. An extensive comparative study of melons has been arranged for in cooperation with a number of experiment stations. The melons are all grown from the same variety of seed, and in so far as possible the cultivation has been the same. The difference in composition will therefore show the influence of environment upon the sugar content of this highly prized product.

CHEMICAL COMPOSITION OF WHEAT.

The collaboration of a number of experiment stations in determining the influence of environment upon the chemical composition of wheat will be continued for the present year. In connection with these studies, a complete system of milling has been arranged for whereby the flour-producing properties of the cereals can be determined in connection with their chemical composition. It is proposed to supplement this grinding with baking tests to determine the qualities of the flour for bread making.

The properties of other cereals in respect of their technical uses is another branch of chemical investigation which will be undertaken during the year. This is particularly true of barley used for the preparation of malt and the development of the diastatic ferment for converting starch into sugar.

EFFECTS OF COLD STORAGE ON THE CHEMICAL COMPOSITION OF FOODS.

In conjunction with the National Warehouse Association an investigation of the effects of cold storage on the composition and nutritive value of foods will be undertaken. The association will bear the expense of the storage and transmission of the samples. The line of work marked out is, first, the determination of the composition and nutritive value of the foods when placed in storage, and, second, the withdrawal of certain portions of the whole amount, from time to time, for a similar examination. The length of time for the whole study will be that of the usual time of storage.

CHEMICAL COMPOSITION OF WINES, CIDERS, ETC.

In conjunction with the viticultural associations of the country, and in collaboration with the agricultural experiment station at Blacksburg, Va., extensive analyses of wines and ciders will be made. The object of these analyses is to determine the chemical composition of wines and ciders, with reference to the effect which different processes of vinification and fermentation have upon the chemical properties. The importance of this investigation to our fruit-growing interests is evident. A work of this kind will supplement in a practical way the work of the orchardist and viticulturist by showing the best methods of securing a higher grade product for the market after the fruits have been grown.

DENDRO-CHEMICAL INVESTIGATIONS.

Extensive investigations of the chemical composition of forest products of the country will be undertaken in collaboration with the Bureau of Forestry. The first work of this kind will be the study of the tannin products in the different varieties of tannin-bearing trees. There has

never been a systematic study of the chemistry of our forest products, and this work promises much of interest and benefit in this direction.

DAIRY CHEMISTRY.

In collaboration with the Bureau of Animal Industry, the study of dairy products will be continued. Many problems of great importance await investigation, and work will be done in this line in so far as the routine analyses of dairy products will permit.

REVISION OF BULLETIN NO. 13.

The early editions of the parts of Bulletin No. 13, on food adulteration, are out of print. Work has already been commenced toward the revision of these parts, for which such an unusual demand has been made. A large amount of material for the rewriting of Part I, on dairy products, has already accumulated. Work has already been commenced for the rewriting of the part devoted to tea, coffee, and chocolate. Other parts of the bulletin will be revised and brought up to date as soon as possible.

INSECTICIDES.

The study of insecticides, in collaboration with the Division of Entomology, will be continued for the purpose of making a complete study of the chemical composition of all the insecticides sold in the United States. This work will be devoted to the study of the composition of new forms of insecticides as they are brought upon the market.

COLLABORATION WITH THE ASSOCIATION OF OFFICIAL AGRICULTURAL CHEMISTS.

This very important part of our work will be continued during the year in all branches of investigation. The Secretary of Agriculture has made the referees of the association special correspondents of the Department, whereby they are privileged to use the frank of the Department in correspondence relating to their work and in transmitting samples for comparative study. There is probably no branch of the work of the Division, now Bureau, of Chemistry which has been of such direct practical benefit to the farming interests as the work of this association. The existence of the association has been made possible only through the patronage of the Department, which has made its work a part of the studies of the Division, and enabled the results of its proceedings to be placed in a suitable form in the hands of agricultural analysts throughout the country. This work has been fully appreciated, not only in this country, but also in Europe, and the official methods adopted by the association are now accepted throughout the world as standard methods of analysis.

INVESTIGATION OF ROAD MATERIALS.

The laboratory for the investigation of road materials will be more fully equipped during the year, and, in collaboration with the Office of Public Road Inquiries, an extensive investigation will be made of the physical and chemical properties of the materials used for road building.

COLLABORATION WITH OTHER DEPARTMENTS OF THE GOVERNMENT.

The work of supervision of the sugar laboratories of the appraisers of customs in Philadelphia, New York, and Boston will continue to be directed by the Chief of the Bureau of Chemistry under the agreement between the Secretary of Agriculture and the Secretary of the Treasury.

The examination of foods and other supplies for the commissary department of the War and Navy will be continued.

The work in water analysis for the Interior Department will be completed about November 1, 1901.

The examination of miscellaneous articles, of inks, substances supposed to be unmailable, etc., for the State, Post-Office, and other Departments will be continued.

PROPOSED WORK FOR THE FISCAL YEAR ENDING JUNE 30, 1903.

The proposed work for the year ending June 30, 1903, will be a development and extension of the lines of work already pointed out. An effort will be made to complete the organization of the Bureau of Chemistry so as to segregate, so far as possible, the different lines of investigation. It is evident, however, that all forms of chemical work are interlocked in such a way that a complete segregation is not desirable nor possible. The principal lines of work for the Bureau of Chemistry, as planned up to the end of the fiscal year June 30, 1903, are as follows:

FOOD STUDIES.

The study of the composition, adulteration, and nutritive properties of foods will be devoted particularly to a revision of Bulletin No. 13. The object of this work will be to extend the investigations to bring the work up to date and to coordinate in a better manner than was possible in the first series of investigations the different parts of the work. The food laboratories will afford one of the principal fields of investigation for the Bureau.

Congress has authorized the Secretary of Agriculture, through the Bureau of Chemistry, to analyze and certify to the character of exported food products sent to countries where physical and chemical tests are required in commerce in foods. There is, perhaps, no part of the work of the Bureau which would be of more practical advantage in enlarging our foreign markets than this. Unfortunately, no funds were appropriated to carry out the provisions of the act of Congress, and therefore a special appropriation is recommended in the estimates for the purpose mentioned. If Congress will give the required funds, we will be able to send our food products abroad with a certificate of character which will not permit them to be lightly dealt with by officials of foreign countries interested in excluding them from their markets.

STUDY OF PLANT FOODS.

The investigation of soils, in regard to the available plant food which they contain, and fertilizers will be continued and extended in collaboration with the Association of Official Agricultural Chemists. It is believed that the investigations which have already been completed have opened a new field of study which is full of promise for practical agriculture.

THE COMPOSITION OF SUGAR-PRODUCING PLANTS.

The increasing interest in this country in the sugar industry renders it advisable to continue, somewhat more systematically, the investigations which the Division of Chemistry has conducted during the past quarter of a century on sugar-producing plants. The appropriation to be asked for will include the study of all sugar-producing plants, viz, sorghum, sugar cane, and the sugar beet. The consumption of sugar is rapidly increasing, and, even with the aid of our insular possessions, we are still very far from supplying our own consumption. There is, perhaps, no other one industry, the development of which means so much to our agricultural interests, as that of our domestic sugar supply. This can only be accomplished in conjunction with careful chemical studies of the plants themselves, the changes which they suffer by environment, and the foods which supply their growth. It is hoped that this branch of investigation in the Bureau may include the following points:

(1) The collection of statistics relative to the sugar industry of the United States and its possessions.

(2) Investigations and collection of data concerning the adaptability of various parts of the United States to beet and sugar-cane production.

(3) Collection of technical data relative to the foreign sugar industry, for the purpose of keeping domestic producers advised of new methods in manufacture, etc.

(4) Publication, at regular intervals, of circulars including abstracts of descriptions of new methods, processes, machinery, and of investigations appearing in foreign sugar journals.

DENDRO-CHEMISTRY.

The progress of the Bureau of Chemistry will be, perhaps, more pronounced in the direction of dendro-chemistry than in any other one line of investigation. It is proposed to undertake, in collaboration with the Bureau of Forestry, investigations of the constitution of trees, products of distillation of wood, manufacture of wood alcohol, wood tar, acetone, and other products of the destructive distillation of wood; investigation of tanning materials, manufacture of tanning extracts, studies of distribution of resins and gums in wood, investigations of the use of wood pulp for paper making, the manufacture of cellulose, studies of the methods of preserving wood, and other chemical and techno-chemical processes relating to forest products.

CHEMISTRY OF DAIRY PRODUCTS.

The investigation of the chemical composition of dairy products will be continued, in collaboration with the Bureau of Animal Industry, and all proposed methods which have any promise of merit will be investigated. By act of Congress, the exporters of food products which are subjected to chemical and physical tests in foreign countries have a right to demand in the Bureau of Chemistry an analysis and certificate of the character of their goods before shipment. This work, when funds are provided for it, will be a prominent feature of the investigation. There are many other chemical questions connected with the composition of foods fed to dairy cows, and the effects pro-

duced on the chemical composition of butter, which demand further investigation.

INVESTIGATION OF MATERIALS USED IN ROAD CONSTRUCTION.

It is hoped that the investigations conducted in the Bureau of Chemistry in this important line may take first rank among similar investigations in different parts of the world. To this end this laboratory should be enlarged and more fully equipped and its working force increased. It is only in this way that the best results can be obtained and applied in the most practical manner.

COLLABORATIVE WORK WITH OTHER DIVISIONS AND BUREAUS AND WITH OTHER DEPARTMENTS OF THE GOVERNMENT.

This feature of the work of the Bureau of Chemistry becomes more important each year. Definite arrangements for collaboration are now in force and will, without doubt, be continued for the fiscal year ending June 30, 1903, with the Bureau of Forestry, with the Office of Public Road Inquiries, and with the Division of Entomology. A less definite system of collaboration is also established with the Bureau of Animal Industry and with the Bureau of Plant Industry. It is hoped that all these methods and systems of collaboration will assume definite form so as to secure the highest results more economically. For this purpose, I believe it is the unanimous opinion of all those interested in this collaboration that the appropriations for this work should be made directly to the Bureau of Chemistry instead of to the collaborating Divisions and Bureaus, and then assigned to the Bureau of Chemistry.

The collaboration with other Departments of the Government will undoubtedly also be continued and enlarged, as the tendency to the growth of this collaboration has been very great within the past two or three years. Since this collaboration has employed during the past year the time of at least two assistants in the Division, it is evident that a special appropriation should be made covering it. The Departments of the Government interested in this matter will thus be directly benefited and the organic relation of the Bureau of Chemistry of the Department of Agriculture to the general chemical work of the Government be strengthened.

CLERICAL SERVICES.

The expansion of the Division of Chemistry into a bureau, enlarging its work and perfecting its affiliations with other Divisions and Bureaus, and with other Departments of the Government, render necessary a considerable increase of the clerical force. The work of the Bureau of Chemistry peculiarly demands extra clerical services on account of the large amount of computation and tabulation which it requires, as well as the extensive correspondence involved. Through the courtesy of the Division of Statistics we have had a great deal of help in this line during the past year or two, but it is hardly fair to expect this help to be continued when it should be provided for in the Bureau itself. The organization of two new laboratories and the completion of the equipment of three others, making five in all, also involve a considerable extension of the clerical service. As in the

other Bureaus, the services of a chief clerk are necessary. A property clerk has also become a necessity. Perhaps there is no other Bureau, with the possible exception of the Weather Bureau, that has so valuable a collection of property as is found in the Bureau of Chemistry. The platinum ware alone in the possession of the Bureau is worth several thousand dollars. A great deal of the property of the Bureau is constantly passing into use and has to be replaced. The services of an additional stenographer and typewriter are necessary, besides additional assistants for the tabulating work before mentioned.

For the present, it is the purpose of the Bureau to retain the clerical force in a single body and not distribute it among the different laboratories. It is believed that a more economical and efficient use of the force can be secured in this way than in any other.

SALARIES OF HEADS OF LABORATORIES.

Under the present appropriation only one assistant in the Bureau of Chemistry receives a salary of $2,500. The importance of the laboratory work in the Bureau, it seems to me, is quite as great as that in any other, and merits an equal compensation. It is not my purpose to ask for the whole of this increase at once, but only for a moderate amount. It is therefore recommended that the heads of the laboratories receive from $2,000 to $2,500 each.

WORDING OF THE APPROPRIATION BILL.

In order that the scope of the work outlined in the Bureau of Chemistry may be fully set forth before the committee of Congress having charge of the appropriations, a draft of the appropriation bill, in so far as it relates to the Bureau of Chemistry, is submitted. In this draft the estimated amounts for each branch of the work follow each section, but placed in brackets. It is desirable that the whole amount for the Bureau be appropriated in one sum, which is placed at the end, in order not to complicate the accounts of the Disbursing Office.

RECOMMENDATION REGARDING CHEMICAL WORK.

I strongly recommend that all the work of the Department of Agriculture of a chemical nature not otherwise specifically provided for by law be assigned to the Bureau of Chemistry, to be conducted in accordance with a plan to be mutually agreed upon by the chief of Bureau and the officials desiring the work done, and approved by the Secretary. The establishment of chemical laboratories is expensive, and the distribution of chemical work under various directions will lead to duplication, overlapping, and unnecessary expenditure. It is evident that the best and most economical work can be done under a single bureau, and doubtless Congress in establishing such a bureau intended it to have charge of all the chemical work of the Department. Among the investigations of this kind we may mention the study of the nutritive value of foods. These investigations are chiefly chemical, and would find in the Bureau of Chemistry an appropriate direction. The Bureau of Chemistry has sometimes been held responsible for chemical publications with which it had nothing whatever to do and to which its attention was never called until after the publication had been made. It is evident, if in the public mind work of this kind is attributed to the Bureau of Chemistry, that this is an

additional reason why this Bureau should have the supervision of the work and its preparation for publication.

CONCLUSION.

In closing this part of the report, I desire to call your attention to the fact that the Bureau of Chemistry is now organically connected not only with other Bureaus and Divisions of the Department of Agriculture, but with at least three of the great Departments of the Government. Its work is of the utmost practical importance to the farmer and to the public at large. It should receive generous support at the hands of Congress, and the estimates submitted are as modest as is consistent with the actual work which the Bureau will be called upon to do during the fiscal year ending June 30, 1903.

REPORT OF THE CHIEF OF THE DIVISION OF SOILS.

U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF SOILS,
Washington, D. C., August 25, 1901.

SIR: I have the honor to transmit herewith a report upon the work of the Division of Soils for the fiscal year ended June 30, 1901.

Respectfully,

MILTON WHITNEY,
Chief.

Hon. JAMES WILSON, *Secretary.*

WORK OF THE YEAR, WITH RECOMMENDATIONS.

ORGANIZATION.

The organization of the Division has been essentially the same as heretofore. The principal lines of work have been confined to the administrative office, the laboratory of soil physics, the laboratory of soil chemistry, the soil survey of the Eastern division, the soil survey of the Western division, and the tobacco investigations. In the Bureau organization, which has been perfected, these lines of work are all maintained as divisions, and several other lines are under consideration, to be maintained as divisions, as will appear in my recommendations for the coming fiscal year.

The reorganization of this Division into a Bureau of Soils, with a large increase of funds and a corresponding enlargement of the opportunities for work, did not go into effect until July 1, 1901; but as $10,000 had been made immediately available, it was possible to proceed at once with the gradual adoption of the plans which thus occupied fully six months of the fiscal year for which this report is intended. During this entire period the work went on without interruption, and indeed was facilitated and broadened in every way.

This reorganization of the Division was a substantial recognition of the value and importance of its work, as well as of the necessity for extending the soil survey and tobacco investigations to other States and of giving larger salaries to experts, in order to maintain the highest efficiency and to insure the most valuable results.

PROGRESS AND COST OF THE SOIL SURVEY.

The area surveyed and mapped during the fiscal year was 5,596 square miles, or 3,581,440 acres, and the area previously reported as having been surveyed was 3,486 square miles, making a total of 9,082 square miles, or 5,812,480 acres. Field work was carried on during the year in California, Maryland, Michigan, New York, North Carolina, Ohio, Pennsylvania, Utah, Virginia, and Washington; and preparations were all made for field work to be started in Idaho, New Jersey,

Tennessee, and Texas immediately upon the agricultural bill going into effect on the 1st of July, and also for field work in Louisiana, Mississippi, Georgia, and Florida, to be started on the 1st of October, when parties working in the Northern States will be sent South.

The following table gives the areas of soils surveyed and mapped in the several States in which the work has been carried on to the end of the fiscal year:

Areas surveyed and mapped during fiscal year ended June 30, 1901, and the areas previously reported.

State or Territory.	1901.	Previously reported.	Total.	
	Sq. miles.	*Sq. miles.*	*Sq. miles.*	*Acres.*
Arizona		400	400	256,000
California	951	450	1,401	896,640
Connecticut		245	245	156,800
*Idaho				
Louisiana		1,000	1,000	640,000
Maryland	1,137	625	1,762	1,127,680
Massachusetts		155	155	99,200
Michigan	35			
*New Jersey				
New Mexico		100	100	64,000
New York	20			
North Carolina	1,700	100	1,800	1,152,000
Ohio	480		480	307,200
Pennsylvania	320	100	420	268,800
*Tennessee				
*Texas				
Utah	457	311	768	491,520
Virginia	250		250	160,000
Washington	301		301	192,640
Total	5,596	3,486	9,082	5,812,480

NOTE.—Field work in Michigan and New York was started on June 15, but the areas surveyed in this fiscal year were too small to report upon the cost of the work, and they have not been included in the total. The preparations for the States marked with an asterisk (*) were all made in the fiscal year ended June 30, 1901, but the field work was actually started from the 1st to the 3d of July.

There is an increase of 2,200 square miles (or 60 per cent) surveyed over the preceding year, although the cost per square mile of the work in the field was just about the same. This increased area is due to the better training of the men and to the better organization of the work, enabling the parties to remain in the field for a longer time and reducing the cost of the preparation of the reports. The number of field parties and the personnel were the same, except that in the Statesville and Prince George areas the men were brought together on the 1st of April in order to train some new assistants.

The following table gives the details of the areas surveyed and the cost in each district in which work was carried on during the fiscal year:

Area surveyed and mapped, and cost of same, during fiscal year ended June 30, 1901.

District.	Area surveyed.	Cost.	
		Total.	Per square mile.
	Sq. miles.	*Dollars.*	*Dollars.*
Lancaster area, Pennsylvania	170	381	2.24
Lebanon area, Pennsylvania	150	291	1.94
Prince George County, Md	460	1,569	3.41
Kent County, Md	315	243	.77
Calvert County, Md	218	416	1.91
St. Mary County, Md	144	161	1.12

Area surveyed and mapped, and cost of same, etc.—Continued.

District.	Area surveyed.	Cost.	
		Total.	Per square mile.
	Sq. miles.	*Dollars.*	*Dollars.*
Bedford County, Va	250	468	1.87
Statesville area, North Carolina	800	1,824	2.28
Raleigh to Newbern, N. C	900	825	.90
Montgomery County, Ohio	480	571	1.19
Sevier Valley, Utah	150	643	4.29
Weber County, Utah	307	663	2.16
Fresno area, California	175	413	2.36
Orange County, Cal	300	678	2.26
Hanford area, California	216	922	4.27
San Gabriel Valley, California	260	624	2.40
Yakima area, Washington	84	281	3.34
Sunnyside area, Washington	217	336	1.55
Totals and average	5,596	11,309	2.00

Area surveyed	acres	3,581,440
Cost per 100 acres	cents	32

RECAPITULATION.

Cost of field work	$11,309.00
Supplies	434.30
Railroad transportation	1,730.18
Preparation of reports	6,247.85
Total cost of soil survey	19,721.33
Paid by State organizations	1,500.00
Paid by Department of Agriculture	18,221.33

Area surveyed	square miles	5,596
Cost of work in field	per square mile	$2.00
Preparation of reports	do	1.14
Transportation and supplies	do	.39
Average cost	do	3.53
Average cost to Department of Agriculture	do	3.26
Average cost to Department of Agriculture	per 100 acres	.51

Cost of field work includes salaries of all men for the time actually in the district, team hire, and subsistence, but not cost of transportation to and from the district.

Preparation of reports includes salaries of men during the winter when they are preparing their reports and not actually in the field.

It will be seen that the average cost of the work in the field this year was $2 per square mile, or 32 cents per 100 acres, which is just about the same as reported last year. The expense varies considerably in different areas, according to the complexity of the work, the price of board and team hire, and the character of the topography and the roads of the district. The relatively high cost of the work in Prince George County, Md., and in the Statesville area was due to the fact, mentioned above, that quite a number of new men were assigned to these areas on the 1st of April for training, and this increased the expense of the work over what it would have been if done altogether by experienced men.

The total cost of the work in the field amounted to $11,309, of which $1,500 was paid by various State organizations. Including the cost of the work in the field, the preparation of reports, and transportation and supplies, the field work has cost the Department on the average $3.26 per square mile, or about 51 cents per 100 acres. This is exclusive of the cost of publication. It is doubtful if the expense of the work in the field can be reduced in the future, and it is likely that it will even be increased somewhat. The cost of the preparation of the reports, however, will be considerably reduced; as, with the

larger number of field parties, it will be feasible to make such assignments as shall keep most of them in the field for much longer periods than heretofore. Parties can be transferred from Northern States in the summer to Southern States in the winter, and in this way the average length of the field season per party may be extended. This will reduce somewhat the total cost of the work per square mile.

ORGANIZATION AND TRAINING OF FIELD FORCE.

For administrative purposes the soil survey has been divided broadly into an Eastern division and a Western division. It was at first intended to put all the work east of the Mississippi River into the Eastern division, and all west of that river into the Western division, and this may yet be done, but the real separation is now based upon the character of the work, as the Western work has been confined almost exclusively to the irrigated areas, where the use of irrigation water and the frequent occurrence of alkali give problems of a distinct character seldom met with in the East, which require special training and special apparatus.

During the summer of 1900 five parties were in the field as long as the conditions were favorable for field work, or until the middle or last of November. Two of these parties were in the irrigated districts of the West, and three were in the Eastern States. The parties consisted of two men each, with a team and suitable instruments, but without a camping outfit, as the work was generally confined to well-settled districts.

By the 1st of December the parties had all returned to Washington, and the examination of the specimens and the preparation of their reports were well under way. The maps had been prepared in the field as the work progressed, but these were given some necessary revision and put in shape for the lithographer.

Foreseeing the probable extension of the soil-survey work, as recommended in my last report, and the necessity of training the younger men for principal field assistants, much care and attention were given to their laboratory training and their reading, and during the winter a seminar was regularly held once a week at least, and a systematic course of instruction given by the experienced men in the Division of Soils, with occasional talks by men from other Divisions in the Department on related lines of work. This method of instruction proved to be exceedingly profitable and instructive to all who attended. Unfortunately, there is no course of instruction in any of the colleges and universities which gives the knowledge or experience that will fit men for this line of soil work, and such training in the Division was considered essential in the organization of an efficient force.

When it became certain that an extension of the soil survey would be provided for, a number of men with the best possible education were selected, and two large parties were organized on April 1 for the thorough training of the men in the field methods. One of these was located in Prince George County, Md., and the other in Iredell County, N. C. With the concentration of all the Eastern men at these two points, a considerable area was surveyed in each, and the men were well trained in the field methods by July 1, when the reorganization went into effect. At that time eleven parties were organized, three in the West and eight in the Eastern States, provision being made for frequent and careful inspection of the field work. The results have proved a most gratifying success, and the organization of the field force is considered particularly strong.

PURPOSE OF A SOIL SURVEY.

It seems hardly necessary to touch upon the purpose of a soil survey, as this has been dwelt upon at length in previous reports and publications, and is clearly shown in the results that have been attained. That these results have been of value to the communities and to the country at large has been attested in many gratifying ways. Requests for the extension of the work have come from prominent and thoughtful men in nearly all the States and Territories, and from those interested in many of the large agricultural interests, such as sugar beets, tobacco, wheat, truck, rice, fruit, and especially from many areas where peculiar conditions of soil, climate, transportation, or labor make it necessary to introduce new crops or new methods for successful competition in the markets of the country.

Our parties of trained soil experts, remaining as they do from three to nine months in a district, visiting almost every foot of the area and mapping what they find, studying the methods and conditions, meeting the people and learning of their successes and failures, can not help acquiring a fund of information relative to the soils, crops, and methods, which should be a basis for the introduction of new crops or of improved methods. The field men have at all times the cordial support and all the resources of the laboratories of the Bureau of Soils and of the other scientific Bureaus and Divisions of the Department.

Demands have been made on the Bureau for the extension of the soil-survey work to Alaska, Porto Rico, Hawaii, and more recently from the War Department for trained men for similar lines of work in the Philippine Islands. The lack of a sufficient number of trained men has prevented an extension of the work to any of these areas heretofore, but it is believed that these demands may be met in a short time.

DETAILS OF THE FIELD WORK.

WESTERN DIVISION.

The Means party.—Work was continued in the Fresno area until August 10, when about 640 square miles had been surveyed. Mention was made of the results attained in this work in my last report. In September the party moved to Santa Ana, Orange County, Cal., and surveyed about 300 square miles. Mr. Means met with an accident soon after his arrival there and his assistant, Mr. Holmes, was put in charge of the work. The area surveyed there extends from the foothills to the Pacific Ocean, the main part being formed by the vast delta plain of the Santa Ana River. In that portion of the area above the 70-foot contour there is little or no alkali, and the lands are well adapted to citrus fruits and nut trees. Below this elevation the low lands are devoted either to alfalfa or natural pasturage and to important special industries of celery and truck growing. The fruit industry is hardly known in this portion of the area.

Nine different types of soil were recognized, each with distinctive agricultural values and best adapted to different kinds of crops. The soils of the high lying portions of the areas are, as a rule, well drained, and owing to the small amount of water available for irrigation and the care which has to be exercised in the use of it very little alkali has been found. The cementing of the canals and ditches to conserve the water gives an object lesson of the practical value of care and economy in the use of water on soils of this character in preventing the rise of alkali.

The Gardner party.—The area in the Sevier Valley was finished during the first months of the fiscal year, the principal results having been given in my last annual report. Upon the completion of this the party moved to Ogden and surveyed and mapped about 310 square miles, mainly in Weber County, Utah. This area is divided into two agricultural districts—a broad delta plain, upon which Ogden is situated and in which the principal irrigation is carried on, and an upland portion composed of foothills and mountainous land. In addition to these, there is an area of nearly 100 square miles of recent delta, formed by the recession of the Great Salt Lake since the early surveys were made in 1858. This land is now so full of alkali that no cultivated crops are grown upon it.

The principal crops of Weber County are peaches, pears, prunes, plums, sugar beets, tomatoes, and other canning crops. Eight types of soil were recognized and mapped, each having more or less distinct differences and adapted to different agricultural interests. The prevailing type is the Fresno fine sandy loam, which covers about 43 per cent of the area. It is the most important soil agriculturally, as it is adapted to the greatest variety of crops. There is, however, trouble in this, as in most of the other soils, from alkali and seepage water. Lime hardpan extends under considerable areas of the delta soils and occasions some trouble, and it has been the subject of investigation in the laboratories of the Division. The irrigation water of the district is exceptionally good and free from alkali. There is more than enough water to irrigate all the lands within the area, provided it were distributed at proper seasons of the year. Unfortunately, however, the larger portion of it comes in the early spring, and there is frequently a shortage during the growing season. Plans are being considered for a large storage reservoir to equalize the distribution and to insure against seasons of drought and low water. Many of the canals run over deep sandy soils, with no protection against seepage, and Mr. Gardner estimates that fully half of the water is lost in this way. This is not only an unnecessary waste of water, but it is the cause of a large amount of injury by the subirrigation of large areas in which the ground water is so near the surface as to be harmful to crops.

The whole area surveyed contains about 198,400 acres, of which 137,000 acres could be irrigated. There are actually about 40,000 acres under irrigation. In about 83,000 acres there is so little alkali that their use for cultivated crops would be absolutely safe. About 16,000 acres have sufficient alkali to make their cultivation at least dangerous, while there are 99,000 acres containing too much alkali for crops. Good lands in this vicinity are worth $100 an acre, and when set with valuable fruit trees much more than this, so that the importance of this alkali problem here is apparent. It was shown that underdrainage will remove the alkali and reclaim most of the abandoned land.

The Holmes party.—About 200 square miles have been surveyed in the San Gabriel Valley, California. The problems encountered were purely soil problems, as there is little land injured from alkali or seepage water. The soils are almost altogether derived from granite rocks, disintegrated and carried out by floods. All of the soils are light—sand, sandy loam, and sandy adobe predominating. There are no alkali soils in the valley except a few small spots at the narrows, where the San Gabriel River leaves the valley.

The depth to standing water is great, and the difficulties of obtaining water enough to keep the crops alive during the past dry years have been the cause of much expense.

The principal crops are grain, citrus fruits, a small acreage of stone fruits, and grapes. The valley at one time was largely planted to grapes, but the California vine disease caused the loss of nearly all the vineyards.

The most important problem which was encountered was the question of fertilizing the soils. California has no fertilizer-control law. Numerous brands of fertilizers are manufactured, each with a special object in view, and all are sold at high prices and with no guaranty but the manufacturers' analyses. The farmers are using large quantities of these fertilizers, in many cases unnecessarily and in most cases without discretion, but in the hopes of supplying the requirements of the plant and of increasing the yield of fruit. There is great necessity for information on these points, and this information can only be gained through extensive plot experiments. The soil maps will show the best places to carry on this experimental work. Investigations in this line by some one competent to undertake such studies should be started at once, and the excessive application of fertilizers should be stopped unless the necessity of such large applications is proved by experiment.

The Jensen party.—On April 15 a soil survey was started in the Yakima Valley, Washington. The soils were found to be very uniform, the predominating type being a fine sandy loam. They are derived from sediments deposited in the old John Day Lake, a large body of water which covered an extensive area in Washington, Idaho, and Oregon in post-Tertiary times, and to this fact is due their uniformity. Only where stream action has disturbed and reworked the sediments, or where wind has accumulated the sand, is the almost perfect uniformity broken.

Frequent mention has been made by agricultural investigators of the alkali of the soils in the Yakima Valley. The area of alkali land which was found by our parties is very small when compared with the area which has been irrigated, but the land which is damaged is near Yakima and is the most valuable land in the valley, owing to its proximity to town and the ease with which it can be irrigated. Under the Sunnyside Canal, below North Yakima, practically no land has been damaged yet, but there is alkali in the subsoil which may rise to the surface in low places. Excessive amounts of water for irrigation are constantly being used, and the subsoil is rapidly filling with seepage water. If this rise of subsoil water goes on much longer land will suffer. Only a small percentage of the available land is irrigated at present, and it is hoped that the dangers of overirrigation may be shown so clearly that land which is now threatened will be saved.

The Lapham party.—About 216 square miles were surveyed around Hanford, Cal. The most important problems encountered in this section are those of seepage water and alkali. All of the land is low, most of it being in the slough country along the axis of the San Joaquin Valley. The drainage is into Tulare Lake and into the San Joaquin River, by way of the sloughs which connect the Kings and San Joaquin rivers. During the winter and spring months the sloughs and streams fill with water and soak the subsoil so that standing water is found at less than 6 feet from the surface of the ground. Everything possible is done to assist this filling of the soil with water,

for the success of the following crop is supposed to depend upon the water which is thus stored in the soils. The natural drainage by the sloughs is often artificially blocked by dams during this period, and the irrigation canals continually carry water onto the land. There is no question but that the crops are benefited by the water stored in this way at certain seasons, but at the same time some of the most valuable land is being ruined by the rise of alkali, due to the high water table. Already large areas are left out of cultivation, and unless the present practices are changed further damage will ensue. Instead of damming the drainage systems, everything possible should be done to carry off the winter's excess of water, and instead of depending upon subirrigation to furnish the needed water supply, the water should be applied by irrigation from the top of the ground, which would tend to drive the alkali down. In order thoroughly to reclaim the district and insure against further damage, a drainage district should be formed and outlet canals be dug for the free passage of the excess of water, and the sloughs which are now dammed should be opened.

If winter irrigation is to be practiced, it should be from the surface, for subirrigation in such soils, particularly if the level of the standing water comes to within 4 or 5 feet of the surface, involves serious danger of the rise of alkali.

There are large areas of land already alkaline which could be reclaimed at a profit, and it is hoped that these investigations will make this point so clear that the people of the district can be prevailed upon to make the experiment of reclaiming small areas at least for demonstration.

EASTERN DIVISION.

The Dorsey party.—During the first part of the fiscal year the Lancaster area was completed, having been started during the latter part of the previous year. Lancaster County, Pa., was selected for the work, as it is an important tobacco-producing section, and is one of the oldest as well as one of the finest agricultural districts in the country.

The area surveyed consists of a broad limestone valley, with sandstone and shale ridges of sedimentary rock, and, in the southern part, of the Piedmont plateau of crystalline rocks. The surface is gently rolling, and is well watered by numerous streams. The most important soils are the Hagerstown loam and the Conestoga loam, each covering nearly one-third of the area surveyed. They are both formed from limestone rock, the former from a hard massive limestone and the latter from a softer schistose limestone, making the soil soapy or greasy to the touch. Both are excellent soils for wheat and corn and are typical soils for the grade of tobacco grown in Pennsylvania. The Edgemont stony loam is similar to the mountain peach soil of western Maryland, which has become famous for the production of a fine quality of late peach. It is unsuited for wheat or general agriculture. The Donegal gravelly loam occurs near the Susquehanna River, and it is upon this that the fine wrapper leaf tobacco has been produced, similar to the Connecticut leaf, it being the only soil in the area which will produce this grade of tobacco. Other soils were found of less importance either from their slight extent or from their small agricultural value. The difference in the commercial value of these lands is very great. The best limestone soils are worth from $125 to $250 an acre, while some of the other soils have merely a nominal value.

It is thus seen that even in this thickly settled and long-established community there is a great variety of soils, adapted to different agricultural interests, and the investigations indicate that new industries may be established on soils that at the present time are held in slight esteem.

Important lessons are taught from the industry of the people, which would be of immense practical value if applied in other localities. Active steps have already been taken to follow up this survey with an attempt to introduce a better type of tobacco on certain soils which closely resemble some of the Cuban soils, as will be pointed out in another place.

The party proceeded from Lancaster, Pa., to Dayton, Ohio, where a soil survey was made of Montgomery County, comprising an area of 480 square miles. Montgomery County is one of the prominent agricultural counties of the State, and the center of the Zimmer Spanish cigar-filler tobacco district. The soils of the county are derived from glacial débris or glacial material which has been reworked to some extent by stream action. The county consists of a broad rolling upland, which is cut by many broad and beautiful valleys along the principal streams. The soils of the upland are the slightly weathered products of the great sheet of till that was left by the ice. These soils are locally known as "sugar-tree" lands, and are heavy clay loams, which produce the finest quality of Zimmer Spanish tobacco. Formerly they were covered with a thick forest growth and in many places by great quantities of bowlders. In addition to producing a fine quality of tobacco, these soils have long been noted for their general agricultural value. Occupying slight depressions in the uplands occur the black soils, which undoubtedly represent former swamp deposits. These soils, when thoroughly drained, make desirable farm lands and produce a fair quality of tobacco. The soils of the river bottoms have been to a large extent deposited and reworked by stream action and consist of sandy and gravelly loams. The heavy black loams are famous corn lands, while the gravelly loams are perhaps the finest farming lands found in the county. It was on the gravelly loams that the tobacco industry was started in the early part of the last century, and, while the sugar-tree land produces a finer type of tobacco, it is still one of the principal crops on the gravelly bottom lands.

In the spring of 1901 the party moved to Statesville, N. C., where a training camp was established and an area of 800 square miles surveyed. The soils in the Statesville area are residual soils, derived by the slow process of subaerial decay from granites, gneisses, schists, and other metamorphic and igneous rocks. Large bodies of Cecil clay and Cecil sandy loam were found in the area. These soils are used at present for cotton, corn, and wheat. Formerly bright tobacco was grown on the Cecil sandy loam, and it was thought for some time that the industry would prove a success, but competition with other areas better adapted to growing this tobacco drove the industry from this section of North Carolina.

Small areas of Durham sandy loam were mapped, which is an ideal bright tobacco soil, but this soil does not occur in sufficiently large areas to warrant the development of the bright tobacco industry. It was all the time apparent during the progress of the survey that the agricultural possibilities of both the Cecil clay and the Cecil sandy loam have never been realized. Land is so plentiful and so cheap that when one field is exhausted by injudicious cultivation and by

lack of sufficient fertilization it is abandoned to grow up in pine and another area is cleared to be in turn exhausted and abandoned.

There is a scarcity of good farm labor. The majority of the farmers have not the means to cultivate properly one-fifth of the land they own, yet they attempt to cultivate it all, with the result that not more than one-fourth of a full yield is harvested. In some sections of the area, as about Mooresville, successful farmers have taken worn-out farms and in three years made them pay for themselves, besides greatly improving the productiveness of the soil. This proves the possibilities of some of the really fine areas of farm land of the Statesville district, and should be given considerable notice as an example of what improved methods of cultivation will accomplish.

It is the purpose of the North Carolina department of agriculture to follow up this work closely, and the soil map will be used as a basis for further investigations as well as for the location of another experiment test farm.

The party next proceeded to Virginia, where a soil survey was started in Bedford County. This area includes a portion of Piedmont, Virginia, and the Blue Ridge Mountains. The soil types recognized are residual soils derived from the decomposition of old eruptive metamorphic rocks. The Cecil clay covers the greater part of the central portion of Bedford County and makes a fine grass and corn country. Considerable attention is paid to the raising of cattle, and the region is a good heavy shipping and manufacturing tobacco district. Small areas of Cecil sandy loam were mapped, which in a few instances have been used for bright tobacco.

Mountain lands, of which there are several varieties, possess great possibilities for the development of the apple industry. The county is at present recognized as a prominent apple-growing district. There is great room, however, for the further development of the apple and peach industry, and soil types are being recognized and mapped which are in every way identical with the famous pippin, winesap, and other noted apple lands of Albemarle County.

The Bonsteel party.—In the first part of the fiscal year the soil survey of St. Mary County, Md., was completed, it having been begun in the latter part of the preceding year. After this, Calvert County was surveyed, the soils being the same in each area, but of different relative extent. St. Mary County covers an area of about 360 square miles of land surface, and Calvert County of about 218 square miles. Both counties lie wholly within the area of the coastal plain, and are of unconsolidated material, originally laid down in nearly horizontal beds under water. The upland portions now range from 90 to 200 feet above tide level, and are very much eroded by cutting down through the successive layers, exposing eight types of soil. These soils range in texture from the stiff clay lands of the Leonardtown loam and Sassafras loam to the loose incoherent sands of the Windsor sand formation and the gravels of the Susquehanna formation.

The Sassafras loam is in fairly good condition, and produces fairly good crops of wheat and corn. The Leonardtown loam, which is a very strong clay soil, should be equally well adapted to these crops, and should have nearly the same value as the Hagerstown loam of the Lancaster area. The soils, however, are generally acid and are very imperfectly cultivated by inefficient labor and poor methods. They range in value from $3 for uncleared land to $10 as a maximum price for cultivated areas.

The results of the survey indicate that these lands can be easily and cheaply reclaimed, and a few cases in which this has been done show plainly that they will then become exceedingly fertile and profitable. There is very little ready money in the county and some of the farms are heavily mortgaged, which, with the scarcity and inefficiency of the labor, has a deterrent effect upon improved and more thorough methods.

Large areas of Norfolk sand were mapped, which is a typical soil for early trucking, but the industry has not developed to any very great extent in either of these counties. There are numerous waterways, with cheap transportation by water to the markets of Baltimore and Washington. The Windsor sand of the old pine barrens is used to some extent now for peaches, and the trees are healthy and long-lived and produce a fruit of high color. About 23 per cent of the area in St. Mary County and about 11 per cent of Calvert County consist of meadow lands, which, if underdrained and properly cultivated, would produce excellent corn and wheat, but in their present state they are lightly estimated.

On the completion of these areas the party moved to Kent County and surveyed an area of about 315 square miles. This area is also within the coastal plain, and many of the soils are similar to those just described. There is less of the meadow land and none of the Leonardtown loam, but large areas of Sassafras loam were mapped, and these soils and other soils in this area are in a high state of cultivation and are used for crops that seem to be particularly adapted to them.

In the spring of 1901 the party made a survey of Prince George County, Md., comprising an area of 460 square miles. Several new men were added to the party at this time for training in field methods. The area lies north of St. Mary and Charles counties, and is practically all within the coastal plain. All of the soils are encountered here that were found in St. Mary County, and several new and important types were discovered. In this area, also, the soils are not used entirely for the crops peculiarly adapted to them.

There are great possibilities in the specialization of crops in this area. It is quite close to both the Washington and Baltimore markets, and there are many industries that could be developed that are now but slightly recognized. The soil maps show the distribution of these different types, and should form a basis for intensive cultivation of a variety of crops. There is an opportunity for stock raising on the Leonardtown loam and on the Sassafras loam; for small fruits and truck farming on the Norfolk sand, the Malboro sand, and the Collington sand; for wheat and corn on the Collington sand and the Susquehanna clay loam, and for fruit growing on several of these and on some of the other formations.

The Smith party.—In the summer of 1900 a soil survey was made from Raleigh to Newbern, N. C., and an area of about 100 miles in length, averaging about 9 miles in width, comprising a total of about 900 square miles, was surveyed. Sixteen distinct soil types were recognized and their agricultural value determined. This great variety was due in large measure to the proximity of the Neuse River, which has considerably altered the materials within a few miles of its channel.

The area surveyed extends from the Piedmont plateau to the tide-water region. In the Piedmont plateau the soils are derived from residual decay of metamorphic rocks, and are adapted to cotton and

general agricultural purposes. On the coastal-plain portion, which covers the greater part of the area, sandy and silty soils predominate, adapted to cotton and to the production of a fine quality of bright tobacco. In the lower part of the area around Newbern the trucking industry has been largely developed on the light sandy soils of that area. The relation of these 16 types of soil to crops was everywhere quite pronounced, and in the report the special adaptations were pointed out and the relative value of each soil for the different classes of crops was shown. There are considerable areas of muck soils, which should be used for the special crops adapted to such soil conditions. There are also large areas of pocoson and savanna soils, which will require extensive improvement in the way of drainage before they can be made at all productive or safe for crops. There is also a considerable area of Garner stony loam, which consists of from 6 to 15 inches of a sandy loam, containing from 40 to 60 per cent of rock fragments and gravel, underlaid by a stiff red brick clay. The overlying soil material is firmly compacted and has the effect of macadam, rendering cultivation exceedingly difficult and making the soil adapted only to forest growth. The Selma silt loam is the most valuable soil for bright tobacco, especially in its sandy phases on the ridges that traverse the area. In its siltier phases it is one of the finest cotton soils of the locality. Altogether, the soil maps are full of detail, as the types very often are in small areas, but as their agricultural values are very marked the possibilities are shown of improvement through the adaptation of crops particularly suited to each type of soil.

In May, 1901, the party proceeded to Pennsylvania and started a survey of the Lebanon area, but the results of this work will not be given at this time.

FIELD WORK IN PROGRESS AND ARRANGED FOR.

In the latter part of June, 1901, parties were organized and sent to Chautauqua County, N. Y., and Allegan County, Mich. The areas surveyed during the fiscal year, however, were so small that no results can be given at this time. Other parties were sent out the 1st of July to Montgomery County, Tex.; Montgomery County, Tenn.; Salem County, N. J., and Ada County, Idaho, and arrangements have been about completed for work in the fall of 1901 in Georgia, Florida, Mississippi, Louisiana, and in the Colorado Desert of southern California, as well as in Arizona.

DRAINAGE INVESTIGATIONS.

Attention has frequently been called in the reports of the Division of Soils to the possibility and feasibility of reclaiming alkali lands and preventing the deterioration of lands from alkali by efficient underdrainage. This has been dwelt upon by other writers and presented in the strongest possible terms as the most rational and safe method of solving the alkali problem. Unfortunately, on account of the conservatism of growers, these recommendations have received little or no attention, and there is no general recognition of the possibilities of controlling the problem in this way. Owners who are not at present troubled with alkali do not appreciate the necessity of protecting themselves; and it is a curious fact that just before the alkali becomes so strong as to prevent profitable cultivation the crop yields are the largest. After that the lands deteriorate so rapidly that the

owner is disheartened, and is not inclined to invest money where ordinary means of cultivation have failed to produce profitable returns. It was necessary to make a practical demonstration of the possibilities of growing Sumatra tobacco in Connecticut to get the industry started. The recommendations of the Department in this regard were unheeded until the correctness of its predictions was thus demonstrated.

Attention was called to the possibility of reclaiming the alkali soils of the Yellowstone Valley in Bulletin No. 14, and, in Report No. 64, the desirability of reclaiming the great alkali flat in the Salt Lake Valley, covering upward of 60,000 acres of redeemable land, was pointed out. I feel that it will be necessary, in order to secure the greatest benefit from the soil investigations, to make an actual demonstration of the practicability and efficiency of underdrainage in the reclamation of these alkali tracts.

In 1864 the government of India published correspondence relating to the deterioration of lands from the presence of alkali, in which the following statements were made:

> In the districts reported there were 59 villages in which the agricultural industries had been wholly or in large part destroyed by the rise of alkali. By the year 1850 it had made great progress and was becoming alarming. From that time until 1858 it increased yearly with frightful rapidity. The cause was attributed to the rising of the springs throughout the tract to within a very short distance of the surface of the soil. First of all is the development of the alkali: second, condition of dried swamp; third, inundation. Water in these valleys used to be about 40 haths (60 feet) below the surface, and in 1858 it was 2 or 3 feet. No temporary improvement can arrest the natural course of things, and notwithstanding accidental checks, the work of deterioration if left to itself will gradually complete itself, the completion depending upon the amount of land the amount of water can affect. Attention is called to proper construction of canals and irrigating ditches, so as to prevent loss from seepage, and the necessity of economy in the use of water. With such precautions taken underdrainage would be a sure means of reclaiming the lands from alkali and seepage waters. There is no economical substance practicable within the means of cultivators of any section capable of remedying the saline matters, but wherever drainage can be accomplished the thorough working of the surface soil, with abundance of water from the canal will, if continued for a couple of seasons, dissolve and carry away the noxious salts; but the drainage must be efficient and rapid, otherwise the salt will merely dissolve and be again deposited in the same place. Drainage will prevent as well as cure, and even a small decimal percentage will surely and in no very long time accumulate to 3 or 4 per cent or more, according to the circumstances of the ground in relation to evaporation and drainage. Wherever alkali comes from, drainage is the only and efficient cure.

With these plain warnings from the reports of English engineers to the government of India, it would seem that the people and the government itself had been sufficiently well informed of the gravity of the situation and of the means for the removal of these causes. Yet, in the reports published by the government of India in 1870, and even as late as 1881, it is stated that underdrainage had not been attempted, and that the recommendations of the engineer officers ten or twenty years before had not been carried out, and that the alkali question was becoming more and more serious and alarming, while the government was being called upon to support large numbers of people who had been rendered destitute by the encroachments of this evil.

In view of such marked examples as this of the ultra conservatism of agricultural communities, and the fact that the recommendations of this Department are little heeded, I am becoming more and more convinced that in order to carry the lessons of the soil survey home to the individual it will be necessary for the Department to undertake a practical demonstration of the efficiency of drainage in the reclamation of alkali lands.

Plans were made for such a demonstration during the latter part of the fiscal year, with the cooperation of the Utah experiment station and some of the public-spirited people of that State. It was proposed to underdrain a small tract of 10 or 20 acres and cultivate the land in a proper way for two or three years, to note the improvements in condition until agricultural crops could safely be grown. The expense of underdrainage when undertaken on a considerable scale should not exceed $15 or $20 per acre, so that the cost of a demonstration of this kind would not be great. Unfortunately, the plans were interfered with, and the work has had to be temporarily abandoned. It should, however, be taken up at the earliest practicable time.

A great interest has been taken in this line of investigation in Montana, Utah, Arizona, and California, the places where the soil survey has been carried on. A great deal of interest has been expressed in this enterprise, particularly in the Yellowstone Valley, at Salt Lake City, and at Fresno, and plans are now under consideration for a demonstration of this kind at these places.

The actual field expenses of such an experiment would hardly amount to more than the cost of publication of a bulletin containing recommendations, which might receive but little notice. The demonstration itself, however, if definitely carried out, would be of infinitely more value, as it would be an object lesson for the people, and could not fail to arouse an interest which would spread throughout the community. While the Department is spending thousands of dollars for the investigation of these problems it does not seem as if the matter of expense of such demonstrations should be considered, provided, as in this case, it seems necessary to use this means to inaugurate better methods which will be of immense benefit to the localities.

SOIL CLIMATOLOGY.

The Division of Soils was originally organized in the Weather Bureau under a clause to "investigate the relation of soils to climate and organic life." When for administrative purposes it was reorganized as an independent division of the Department this work was still recognized as of paramount importance, and is still authorized under the first clause of the annual appropriation bill. It was pointed out that the soil, being the receptacle of the rainfall and maintaining the only immediate water supply for crops, is a factor in climatology, and as different types of soil maintain different quantities of water it may be assumed for all practical purposes that crops growing on these different types of soil, even with the same rainfall and temperature, are really under different climatic conditions. This is the basis of much of the specialization of agriculture and a principal cause of the local importance of certain districts for special crops, such as truck, tobacco, and fruit, as well as for the distribution of such farm crops as corn, wheat, and grass. The recognition of this fact is largely the basis of the soil survey and for the highest prosperity of agricultural communities. Furthermore, it is a well-known fact that the degree and character of cultivation have a marked effect upon the moisture supply of the soil and thus control in no little degree the climatic conditions under which the crop is grown.

In certain sections of the country and on certain soils, notably in California and the Northwestern States, the condition of the soil for various crops and the probable yield can be fairly estimated from the water supply in the soil some weeks or even months before the harvest.

In former reports I have called attention to the progress made in the perfection of instruments for recording the moisture content of soils loss in the field and for determining the tendency to evaporation or of water from plants for which an adequate moisture supply must be maintained. Stations were established in different parts of the country and on important soil types for these moisture records. From these records it was possible to show the normal variations which could occur in any soil between the conditions of excessive wet and drought, and the possibilities were pointed out of determining a numerical relation between the soil moisture and the sunshine, temperature, humidity, and wind velocity, which would enable the climatic condition to be expressed by some figure, representing the relative condition of plant growth at any place in terms of the most favorable condition heretofore observed. This is in no way covered by the work of the Weather Bureau, which is concerned largely with dynamic meteorology, or the laws and prediction of storms, and will involve an entirely different equipment and an independent set of observations taken in the fields and soils of growing crops, rather than in cities and towns.

The value of such observations, taken by a corps of experts trained to observe and understand plants as florists understand greenhouse plants, can not be estimated. Reports based upon such observations in a period of drought, such as the Middle West has just experienced, would show the actual conditions existing far more accurately than is now possible. Furthermore, as the drought limit is approached in any soil, suggestions can be made for preventive measures in cultivation or cropping which may save many bushels of grain on any farm which in the aggregate for all the farmers who would heed the warnings sent out from Washington would save an immense sum of money to the agriculturist.

In my report for 1899 I stated that the investigation had progressed far enough to establish the preliminary plans upon which this work should be begun, and that it was useless to go further until the time arrived for a considerable extension of the work, to make it of value at least to certain industries.

In my opinion, the time has come when this work should be again taken up on a scale commensurate with the extension of at least two or three crop interests. I have therefore recommended an increase in the appropriation for next year, intending, if this is allowed by Congress, to recommend that $25,000 be set aside for this work under the immediate direction of some well-trained and eminent soil physicist, subject to my general supervision. I feel satisfied that the immediate benefit to the farmers will amply repay the expenditure of this sum.

SOIL TECHNOLOGY.

The field parties see many opportunities of improvement in the crops or methods of cultivation in the districts in which they are located, which they have not time, in the rapid progress of their work, to demonstrate, and for which they must rely upon recommendations in their rather brief reports. Such recommendations seldom accomplish the object sought, on account of the well-known conservatism of growers. It may be that the evidence indicates the need of drainage, or the correcting of acidity in the soil, or may suggest the introduction of new and profitable crops. Such suggestions are rarely acted upon in that thorough manner necessary for a practical demonstration, and

it therefore seems advisable, if the full value of the soil survey is to be realized, to organize a division of soil technology to work out the suggestions and demonstrate the efficiency of new methods or the feasibility of introducing new crops, as has been done so successfully in the case of the tobacco work.

I am not ready to make a specific recommendation at this time, as it is difficult to find trained men for this work in this country, and the success of such an organization would depend largely upon the personnel of the force. It would seem that some of our agricultural colleges should turn out such men, but they apparently have not done so. There are practical men who could carry on such work under direction of our scientists, but they are usually so successful as managers of estates that they can not be induced to accept a place for the salaries allowed by Congress in this Department. It seems to be necessary, in this as in other lines, to train the men ourselves.

TOBACCO INVESTIGATIONS.

In my last report I called attention to the success of the exhibit of American-grown leaf tobacco at the Paris Exposition and the number of awards given. After the installation of the exhibit and the work of the jury of awards had been completed, Mr. Floyd, the tobacco expert of the Division, spent some time, under orders from the Secretary, visiting the foreign markets, particularly in Paris, Bremen, Amsterdam, and London, where large quantities of our domestic tobaccos are sold or where we ourselves purchase leaf for our own use. The information gathered in this way of the character of the tobacco from all over the world with which we have to compete in our foreign trade, of the requirements of those markets, and of the methods of selling under the Regie system prevailing in certain of the European countries, promises to be of great value in the investigations which it is planned soon to take up of the export types from Virginia, North Carolina, Kentucky, and Tennessee.

Upon his return to this country, Mr. Floyd took active steps to start some investigations on the improvement of the Pennsylvania leaf, with the object of seeing what could be done with it, and the further object of introducing a more desirable filler leaf, if such a step seemed necessary for the building up of the trade in Pennsylvania tobacco. A soil survey had been made of the principal tobacco districts of Lancaster County, as a basis for the possible introduction of new varieties. In the preliminary work of manipulating the present style of leaf grown in Lancaster County, a different method of fermentation was tried, in which the tobacco is fermented in bulk, according to the practice in Cuba and Florida, which had been successfully used on the Connecticut leaf the year before. Fermentation by this process is completed within forty or fifty days, under the constant supervision of an attendant, who turns the bulk from time to time, and it is thus possible to watch the progress of the fermentation and modify the conditions if circumstances seem to require it. This is a decided gain in point of time, and is much less expensive than the old method of case fermentation, where the tobacco was set aside for from six to nine months in a tightly packed case, in which it was chance whether the tobacco would ferment properly and whether it would escape injury by black rot. The first experiment made was on an old crop which had not fermented by the usual case method, but which had developed a considerable amount of black rot. Bulk fermentation

proved perfectly successful, the quality of the leaf being greatly improved, and no further development of the black rot appearing while the tobacco was in bulk or afterwards. The results of this experiment seemed to be of such marked value that several of the leading packers of Lancaster opened their warehouses to us and installed at considerable expense proper facilities for handling the crop. As a result of this, during the winter and spring of 1901, over 4,000,000 pounds of tobacco was fermented in bulk under our direction, with a total loss of not more than 35 pounds from black rot and all other damage. It is a difficult matter to give any close estimate of the usual damage from black rot, as the dealers hesitate very often before admitting that there is any at all, but a conservative estimate would show a loss annually of at least $500,000 per year in the Pennsylvania crop, and in some years it must considerably exceed this figure. The success of this method of fermenting the tobacco, both in improving the quality of the leaf, which is generally conceded, and in controlling the dreaded black rot, about which there is no longer any doubt, is assured, and it is confidently predicted by the packers themselves that the new method will entirely supersede the old, especially where large crops are to be handled. If this is done it will mean a saving to the State of Pennsylvania alone of an amount far exceeding the present cost of the whole Division of Soil.

In the early spring arrangements were made with four prominent growers on different soil types in Lancaster County to introduce some of the finer Cuban seed, and these experiments are now progressing under our control, the latest reports of the work being very promising. It will, of course, be several months before the actual results can be determined, but if they seem to warrant it, all necessary attention will be given to the important experiments at this point, in the endeavor to raise the quality of the Pennsylvania leaf.

In my last report I announced the complete success of the small experiment of growing a fine type of Sumatra leaf on certain soils in the Connecticut Valley. This experiment had been made on a small tract of one-third of an acre, and it was thought best to extend it to a larger area, in order to see if, under the conditions prevailing and with the large cost of production, the tobacco could be profitably raised in the valley. Accordingly, in the spring of 1901, arrangements were made with a number of farmers in Connecticut and Massachusetts, in areas as widely separated as possible and on typical soils which it was thought could be used for the Sumatra tobacco, and nearly 43 acres were placed under our immediate control. It was agreed that the farmers should furnish all needful material and labor, and that the Department should assume direction of affairs in the practical management of the crop. The understanding is that all the necessary information regarding the actual cost of the work shall be at the disposal of the Department to publish, and that the Department itself shall have the right to sell the crop for the farmers, so as to insure an absolutely impartial judgment from the leaf dealers as to the quality and value of the product. It will, of course, be some time before the actual results of this large experiment will be available for publication. I have estimated roughly, however, that about $20,000 has been invested on the part of the farmers, with no expense whatever to the Department except that of supervision.

The experiment has attracted a most remarkable interest, and prominent growers and packers have visited Tariffville, the Depart-

ment's headquarters for this work, from many places in Connecticut and Massachusetts, as well as from Pennsylvania, New York, Ohio, Wisconsin, and Florida. The present indications are that the crop will yield at least double the cost of production, although nearly three-fourths of the original cost is in what might be termed permanent improvements; that is, in the erection of the shade, which will last from five to ten years. It is probable that within two or three months of the time of the publication of this report the data will be available for the issuing of a special report on this experiment, giving the methods and cost of production and the value of the crop, and it would therefore be unwise at this time to attempt to forecast the results. It is certain, however, that they will amply repay the labor and expense to the Department.

The following, from the Tobacco Leaf of August 7, 1901, under the title of "Shade growing a great success," gives a fair statement of the methods employed and of the way in which this experiment is viewed by the trade:

Taken all and all, it has been many a long year since the tobacco growers of New England have had such cause for self-congratulation as exists to-day. Events have developed this year, which not only give assurance of continued demand and paying prices, but before the astonished grower a vista has dawned which in possibility is limitless. This, of course, refers to leaf production under cover, an industry which, although in its infancy, has now been carried beyond the experimental stage and gives promise of big returns. In the history of the world there has rarely been an important industrial movement that has not had a strenuous opposition to overcome. The opposing forces invariably have arisen from ignorance, prejudice, or vested interest—sometimes a combination of all three. The growing of wrapper tobacco under shade in the Connecticut Valley points to an early revolution in methods which have been accepted and religiously followed for generations; hence it is not surprising that this scheme also should have met, and still be meeting, with its share of ridicule and prejudice. Such sentiments, however, now seem destined to be swept away, and a merited meed of praise accorded those whose enterprise and intelligence introduced the system to the country.

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The credit of first applying the test in New England belongs, we believe, to Mr. M. L. Floyd, the Government tobacco expert. Last year, under this gentleman's supervision, and with the assistance of Mr. John A. Du Bon, of Poquonock, about one-third of an acre of land was planted with Sumatra and Havana seed varieties, and so successful was the issue that some of the more enterprising growers determined this year to try the experiment on a larger scale for themselves.

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The Messrs. Mitchelson are cultivating on their splendid estate no less than four fields, the aggregate area of which is 18 acres. The largest contains 8 acres, and is admittedly the "prettiest" piece of tobacco ever grown in New England. A description of this, although it is not the most advanced of the lots, will suffice for all.

On entering the inclosure one is amazed at the luxuriant growth, symmetry, vivid greenness, and general beauty of the plants. The proprietors have not topped any of their tobacco, and the curious spectacle is presented of tobacco plants almost uniformly 8 feet high, in full blossom, and nearing the ripening stage. The seed used was Florida Sumatra, and the stalks carry the average number of leaves. The latter run from 20 to 24 inches in length, and from bottom to top are expected to "go" wrappers, and wrappers of the ideal size and shape, giving easily two full "cuts" without waste or heavy stem. The yield of the covered farms is expected to run from 1,600 to 2,000 pounds per acre.

As the leaves ripen they are picked and "strung," just as is done in Sumatra, the bottom first and so on until those at the very top are taken—a dividing period of from three to five weeks. The picking is done by experienced hands, and the stringing by women and youngsters. The lathing and hanging is a very pretty process, and it is expected that the first cut tobacco will be quite fit for removal from the sheds before the later is ready to be run up—a great advantage where both space and help may be limited.

The framework of the covering consists of strong upright posts and crossbeams of sawn timber, liberally connected for the double purpose of giving ample support to the cheese cloth and stability to the entire structure. Great care is used in spreading and fastening down the cloth, and from end to end of this 8-acre inclosure there can scarcely be found a hole large enough for a fly to pass through. Nor is this the least of the advantages of the covering. Not only are all insect pests kept out, but the tender leaves are sheltered from hail and wind and a continuous and rapid growth secured through the retention of moisture and an even high temperature. The action is that of a modified hothouse, with the difference that the rain falls unimpeded on the growing plants, and the air passes freely night and day. However, the cloth affords sufficient protection to prevent rapid absorption by the sun, thus preventing the waste of needed moisture and the baking of the soil, and giving a more even temperature for the growth and ripening of the crop. On a hot day the difference in temperature between the shaded fields and the outside is from 12° to 15°; on a cool, cloudy day, from 3° to 5°. The day on which the writer visited the Mitchelson estate the sun was high and strong and the atmosphere clear, dry, and genial. Inside the "tents," however, the air was decidedly moist and oppressive, redolent of rank vegetation and similar in all respects to that met with in dense tropical undergrowths.

Of necessity, the initial cost of the covering is heavy, but as the framework is expected to last from twelve to fifteen years the expense thus divided is materially lessened. Moreover, it is hoped that the cloth itself will last for two seasons, and this is one of the questions which will be determined this year by the Messrs. Mitchelson. The cost of the cloth covering per acre is about $175; that of the framework and labor about $125; a total of $300 or more. From seed to bale it is estimated that the expense to the producer will be in the neighborhood of $700 per acre. While at first sight these figures might seem high, it is easily calculated how well an average yield of from 1,600 to 1,800 pounds of such tobacco as these covered fields are expected to produce would pay. Beyond question it has been proved that a better wrapper tobacco can be grown in New England than was dreamed of even eighteen months ago. But what has yet to be proved is of even greater importance: Can this leaf be grown at a profit; and if so, will the manufacturers of the country take hold of it? The tobacco being raised at Tariffville is admitted by the oldest and most experienced dealer in New England to be the most perfect in appearance that he has ever seen growing, and up to the present time there seems to be no reason why it should not cure out all right. It will certainly be fine in texture and even in shape, size, and color.

The experiments which are being carried on by Mr. Lemuel F. Graves, of Whately, Mass., are likewise interesting. Unlike the Messrs. Mitchelson, he is not using the Florida seed but seed that was guaranteed to him as being the genuine imported Sumatra article; also he has topped his tobacco just as if it had been grown in the open field. Mr. Graves has half an acre under cover, and additional interest is given to his operations from the fact that he has adjoining this plot a quarter of an acre of the same seed growing in the open. His covered plants, while perfect in leaf, have not grown so straight as those at Tariffville, and in consequence the field does not present the same beautifully uniform and symmetrical appearance. This tobacco was set out between June 1 and 5, and is almost ready for picking. It is also double the height of the outside weed growing beside it, but in other respects there seems little to choose between the two lots. However, should a hailstorm pass over the field or an extra strong wind blow, all resemblance would be at an end. Parenthetically it may be observed here that the Messrs. Mitchelson report that there recently passed over Tariffville one of the greatest wind and hail storms known for years, and while a few plants were knocked over by the wind, not a single leaf was damaged by hail; neither was the cloth covering damaged in any way. Mr. Graves also experienced a cyclone and had some of his plants blown down, but these were promptly strung up and seem to be as thrifty as ever. In this tobacco, naturally spotted leaves seem to be far more plentiful than at Tariffville, although a fair proportion was seen at the latter place.

Even this brief reference to the new industry would not be complete without some appreciative recognition of what the Agricultural Department has done to thoroughly test the system, and of the intelligent efforts of Messrs. M. L. Floyd and H. M. Lott to insure its success. Mr. Floyd is well known to cigar-leaf growers in the different States, but Mr. Lott has spent most of his life in Florida. He has for some four years been in the employ of the old firm of Schroeder & Bon, and has had much experience in shade growing in the Flowery State. He and Mr. Floyd are now devoting the whole of their time to watching the development of the New England covered crops, and both of them speak enthusiastically regarding the future industry.

In view of the phenomenal success of the introduction of Sumatra leaf into the Connecticut Valley, and the control of black rot in the Pennsylvania crop, there have been many urgent demands for help in the tobacco industry in New York, Ohio, Wisconsin, Texas, and Florida. Preliminary steps have been taken to meet these demands, but they are so great that it will take considerable time to extend help even where it is most needed. Active measures are being taken, as announced in my last report, for investigating the possibilities of growing Havana tobacco in Texas, and it is aimed to make this experiment one of the strong features of our work for the coming year.

It must not be overlooked that there is pressing need of investigations in the manufacturing and export types of the Southern States, and there have been many requests for such help on the part of the Department. It has seemed wise, however, to confine our attention to the highly organized industry in the production and handling of the cigar types and get this work well established before the other types are taken up. Just as soon as possible, however, the Virginia, North Carolina, Tennessee, and Kentucky districts will be attended to. Preliminary work is being done in several of the States in the construction of soil maps of the important tobacco areas, and plans are being perfected for the improvement of the types and grades of leaf grown there.

During the spring of 1901 a comprehensive exhibit of leaf tobacco was installed at the Pan-American Exposition in Buffalo, modeled somewhat after the exhibit at Paris, although necessarily much smaller, as the space at our command was considerably less.

Another important line which has been taken up is in the securing of tobacco seeds for Congressional distribution. Contracts have been made with leading growers in the various States to have seeds saved from vigorous, healthy, well-bred plants, and arrangements have been perfected for the distribution of these varieties to the districts to which they are particularly adapted. It is believed that this will be a great improvement over the former miscellaneous distribution of tobacco of all kinds to all districts.

LABORATORY OF SOIL PHYSICS.

The work of the physical laboratory includes the investigation of the physical properties of soils and their economic bearing, the physical examination and mechanical analysis of the soil types established by the field parties, and the preparation and testing of the apparatus used in the field work.

THE REMOVAL OF SALTS FROM SOLUTIONS BY SOIL GRAINS.

It has long been known that finely divided solids have the ability to condense upon their surfaces a small proportion of the dissolved substances contained in the solution with which the solid is in contact. This property is known as "adsorption," and is an important factor in the conservation of plant food in the soil, since it prevents the rapid leaching away of the soluble materials and their consequent loss to the growing crops. This property has never been fully investigated, and it seemed very desirable to subject it to accurate measurement and determine how important this property is in the economy of nature. For the preliminary work crushed quartz rock in a very fine state of division was selected on account of its slight solubility,

chemical inactivity, and prominence as a soil constituent. It was found that the amount of the dissolved salt which is removed from solution by the soil grains increases with the concentration of the solution. A very important feature in this connection is that the amount of adsorption is relatively very much greater for the dilute solutions of concentrations found in Eastern soils.

The nature of the dissolved salt was also found to have a considerable effect upon the amount of adsorption. For example, the solutions of substances which have an alkaline reaction, such as caustic soda or carbonate of soda, are adsorbed to a much greater extent than neutral solutions, such as common salt. The magnitude of this property is shown from the experimental fact that, when the soil is saturated with a solution containing 400 pounds of carbonate of soda per acre, 180 pounds of the sodium carbonate is adsorbed by the soil grains, and it is not moved with the soil moisture so long as the concentration remains constant.

This work is now being extended to include natural soils and the common mineral constituents of commercial fertilizers. Investigation is also being made to determine whether mixture of salts exerts any mutual action on the amount of adsorption.

CONDENSATION OF CARBON DIOXIDE ON SOIL GRAINS.

The adsorption or condensation of carbon dioxide upon the surface of fine quartz particles has also been investigated. The existence in the soil of a relatively large amount of carbon dioxide has been known for some time, and the present work leads to the belief that this is very largely held in the soil by adsorption. Since the amount of adsorption is proportional to the pressure of the carbon dioxide, it is evident that the carbon dioxide can be largely removed from the soil simply by loosening the soil so that the contained gas may escape. The pressure of the carbon dioxide is then reduced and the gas adsorbed will be liberated. This feature is of importance, since recent investigations have led to the belief that the acidity of many soils is due simply to the abnormally large amount of carbon dioxide present in the soil. On the other hand, in some cases it is very desirable that the carbon dioxide should not be liberated. For example, in the Sevier Valley, Utah, the alkali exists very largely in the form of bicarbonate of soda, which is much less harmful than the sodium carbonate which would be formed if the carbon dioxide present were allowed to escape freely.

SOIL MOISTURE INVESTIGATIONS.

The investigations on the capillary movement of water in dry and moist soils, begun during a previous year, have been extended, and the subject has been more fully developed. It has been found that the extent of capillary action in the soil under field conditions is not represented by the capillary rise of water in the air-dried soil, the method which has heretofore been employed. A method has, however, been devised through which the extent of capillary action in moist soils may be determined, and which it is believed is fairly representative of field conditions. This method also permits investigation of the rate at which water is supplied by capillary action through soil columns of various heights, a subject which is of fundamental importance, since all plants are to some extent dependent upon the capillary action for their water supply.

The investigations of the influence of dissolved salts on the capillary rise of soil moisture have also been continued. This subject has an important bearing upon the treatment of alkali lands. It was found that dilute solutions of neutral salts have practically no influence upon the capillary action, while concentrated solutions of all salts materially diminish the extent of the capillary movement. In the case of the alkaline salts, however, the capillary rise is considerably greater than for neutral salts of the same concentration. A detailed description of these results and their practical bearing is now in course of publication.

RELATION BETWEEN CARBONATES AND BICARBONATES IN ALKALI SOILS.

In continuation of the work on carbon dioxide an investigation has been made in connection with the chemical laboratory of this Division of the equilibrium between carbonates and bicarbonates in solutions of various concentrations and temperatures. The economic bearing of this investigation and the results obtained will be further referred to.

SPECIAL APPARATUS.

The special electrical apparatus devised in the physical laboratory for the investigation of soluble salt content of soils is now being extensively used by the field parties in the alkali investigations in the West. A filter has recently been devised for the removal of suspended clay from soil solutions, and has been found very useful in the field and laboratory. Perfectly clear soil solutions can be quickly obtained by its use, and chemical determinations in the field which were formerly difficult or impossible on account of the suspended clay can now be readily carried on.

MECHANICAL SOIL ANALYSIS.

During the past year 640 complete mechanical soil analyses have been made. These analyses have been restricted almost entirely to the examination of the various soil types established by the field parties, serving as a check upon the field classification and as a matter of information regarding the mechanical texture of the soils. The method of analysis, which involves the use of a centrifugal apparatus to separate the sand and clay, is much more rapid than the methods formerly employed, and two men can now readily make 50 complete analyses a week.

USE OF PHOTOGRAPHY.

Photography has become a valuable adjunct to the work of the Division, both in illustrating the characteristic features of the areas surveyed and in the preparation of the base maps for field use. The topographic sheets of the Geological Survey are used as base maps whenever available, but frequently we are dependent upon county atlases or other maps. These maps naturally vary greatly as to scale, but can be readily and quickly reduced by means of photography to the uniform scale of 1 inch to the mile, used in the work of the Division. For this purpose a modest photographic equipment for enlarging and reducing has been installed. Photographic paper used is also prepared at small cost in the laboratory, and the preparation of the base maps can now be rapidly and economically carried on.

FUTURE WORK.

It is proposed to investigate as thoroughly as possible during the coming year the apparent forces between soil particles, and the flocculation of clay. The importance of such a research is at once evident, when we consider that the unproductiveness of many soils is due primarily to the compact, unyielding mass resulting from the apparent forces between soil grains. A satisfactory method of bringing soils of this kind into a more friable condition, so essential to proper plant development, would be of untold value to our agricultural interests, and is worthy of the most earnest research.

It is also proposed to investigate during the coming year the diffusion of salts in the capillary spaces of soils. This has never been investigated in a manner applicable to our work, and the information is necessary before proceeding further with the study of the distribution of soluble salts in the soil formation of hardpan, and many kindred problems.

LABORATORY OF SOIL CHEMISTRY.

The work of the past year has involved the examination of a large number of soils, irrigation waters, rocks, minerals, and similar materials, sent in by the field parties, together with furnishing data of a miscellaneous character to others. In addition to this routine work, a number of investigations have been carried on which have yielded results of considerable economic importance, as well as of scientific interest.

The work on the chemical composition of type soils from Maryland, which had been undertaken some time before under the joint auspices of the Maryland experiment station and this Department, was brought to a conclusion. The results have been published in Bulletin No. 70 of the station. The principal needs of the soils with respect to fertilizers were so clearly brought out as to justify suggestions with a considerable degree of confidence.

The study of the effect of certain soluble salts which find application as mineral fertilizers on type soils has been carried on and results of interest have been obtained showing that the solubility of the mineral components of the soil are much affected thereby, generally in the direction of an increased solubility. The importance of this work for a rational control of the fertilizing problem is thoroughly appreciated, but it is not advisable to give details of the work at the present stage of the investigation.

CHEMICAL PROPERTIES OF THE MOISTURE IN SOILS.

Further attention has been given to the subject of soil solutions, or the nature and composition of the material dissolved in the ground waters which are present in all arable soils. The importance of investigations along this line for making clear the chemical and chemico-physical processes taking place in the soil, the relation of the plant to its mineral nutrients, and the development of rational methods of fertilizing, is becoming more evident with the progress of the work. The nature and function of soil solutions has been discussed in a publication from the Division during the year in which the rôle of water, iron, calcium, carbon dioxide, hydrous silicates, organic matter, etc., is carefully considered, together with adsorption by soils, soil acidity, and related phenomena.

THE EFFECT OF A SALT UPON THE SOLUBILITY OF ANOTHER SALT.

The effect of readily soluble salts upon the less soluble mineral components of the soil is obviously of the first importance in the study of alkali and in the use of mineral fertilizers. Experience has shown that lime sulphate, in the form of gypsum, and lime carbonate are probably the most important of the slightly soluble components of the soil in arid regions. Therefore the first work has been done upon these substances.

The solubility of gypsum has been carefully studied in the presence of sodium chloride, magnesium chloride, calcium chloride, and sodium sulphate, and in the presence of sodium chloride with calcium carbonate simultaneously. The effect of these other substances upon the amount of gypsum taken up was found to be very great, the solubility in certain cases being increased nearly fourfold.

In an analogous manner the solubility of calcium carbonate and magnesium has been studied in solutions of more soluble salts, due attention being given to the modifying action of the amount of carbon dioxide in the air.

That the results of these investigations will have a technical value other than for agricultural studies seems assured, and communications have been received from some manufacturing concerns and chemical engineers relative thereto.

THE RELATION BETWEEN CARBONATES AND BICARBONATES IN ALKALI SOILS.

In cooperation with the physical laboratory of the Division a very important investigation was made of the equilibrium between carbonates and bicarbonates in water solutions. For instance, in the valley of the Sevier River, in Utah, where the soils are naturally provided with a fairly good underdrainage and the total amount of the alkali in the soil is low, the proportion of bicarbonates to carbonates found in the soil is large. Seepage waters from the soil, when exposed to the air, either evaporating in ponds or aerated in the rapids of the river, show increasing amounts of normal carbonate as the aeration continues up to certain definite and invariable limits for constant condition. In other areas containing black alkali, as about Fresno, Cal., where the total amount of alkali in the soil is relatively larger, the proportion of normal carbonates to bicarbonates is correspondingly greater, and the former preponderate to such an extent as often to be the most prominent characteristic of these soils. Since it has been made evident that bicarbonates are much less harmful to vegetation than normal carbonates, the economic importance of any work which will throw light upon the subject and aid in its control is self-evident. This work is of value also in connection with the view, for which there seems to be some ground, that basic elements that serve as plant food in the soil solutions of humid regions are present mainly in the form of bicarbonates.

It was shown that even in contact with air containing but a small proportion of carbon dioxide, and all the more in contact with the soil atmosphere, which normally contains a much larger proportion of carbon dioxide, a solution of a normal (caustic) carbonate must also contain some of the corresponding bicarbonate. On the other hand, it was shown that a solution of a bicarbonate under all conditions with which one meets in nature must necessarily contain a definite proportion of the normal carbonate. It was shown that in the case of the lime salts, under the conditions in which natural waters occur, the

proportion of normal carbonate to bicarbonate is so small that the solutions for most practical purposes may be considered as solutions of the bicarbonate alone. But for the salts of magnesium, potassium, and sodium this is far from being the case. In all cases, the proportion of normal carbonate to bicarbonate increases with the temperature and with the concentration. These results are of great significance in explaining the conditions observed in various areas of the arid regions containing soluble carbonates, and which at first appeared hopelessly anomalous. It is believed that the results will have value not only in soil studies, geological investigations, etc., but also in certain technical operations involving the preparation and handling of alkaline carbonates.

CLASSIFICATION OF ALKALI SOILS.

The present classification of alkali soils into those containing white alkali and black alkali, each of which presents an infinite number of problems, is not in keeping with the advance in our knowledge concerning such soils. As a result of the investigations of this Division, a new classification has been proposed, as it indicates that the vast array of problems which the alkali soils have apparently presented hitherto can be grouped into a very few general classes.

It has been shown that alkali does occur in the soils of humid areas under certain conditions, and that these conditions are not unusual. Indeed, it seems probable that the formation of temporary alkali in soils of the humid regions is much more common than generally supposed, and this may account for certain phenomena of plant disease.

ALKALI VEGETATION AND SOILS.

The relation of the natural vegetation of a soil to the inherent characteristics of the soil itself, while a matter of great importance and worthy of the closest attention everywhere, is especially so in alkaline areas. A study of the effect of the growth of certain plants in forming soluble carbonates, better known as black alkali, in soils where this substance had not previously existed, has been continued during the past year. It has been shown that this factor must be considered in the introduction of such plants for forage purposes, as the final condition of the soil may be made worse by the formation of the very harmful black alkali from the white alkali originally present.

A study has been made of certain native plants which have been found to grow on soils containing excessive amounts of sodium carbonate or black alkali, in which no other vegetation will grow. It was found that these particular plants were able to excrete soluble organic acids on their leaves and stems, and these acids are sufficiently strong to decompose carbonates, and thus form neutral salts, less injurious to vegetation. It seems probable that the plants protect themselves from the caustic action of the carbonates by the formation of these acids. The further study of this subject and the possible economic value of these plants is in the province of plant physiology.

The amount of soluble salts which may be present in a soil and yet not prohibit growth has been found with a close degree of accuracy for the various areas in which the field parties have worked. But as the character of the alkali varies in different areas, quite an extended investigation was carried on, in cooperation with the Division of Vegetable Physiology and Pathology, to determine the toxic limit (or

the proportions and amounts which may exist without prohibiting plant growth) of each salt or mixture of salts commonly found in alkali soils or used as fertilizers. The influence of various concentrations of these salts or salt mixtures was noted upon seedlings of alfalfa, white lupine, and wheat. It was found that the limits for these various salts differ greatly. The idea commonly held that the action of these salts is a physico-chemical one alone, and dependent upon the "osmotic pressure" which they exert in the soil solutions and a consequent mechanical rupture of the plant tissues, has been disproved. It was shown that the effect of one salt in raising the toxic limit of another is often very great. The importance of the lime salts in this connection was shown to be enormous, the limit for magnesium chlorides being raised many times in the presence of an excess of lime sulphate. These investigations open up lines of work for the physiologist and for the scientific study of fertilizer applications.

CHEMICAL METHODS FOR USE BY FIELD PARTIES.

The field method for the determination of carbonates, bicarbonates, and chlorides has been further studied in the laboratory, for the purpose of obviating certain mechanical difficulties which had arisen in its use, and also to extend its application to other similar determinations. It is believed that it is now in very satisfactory shape for either field or laboratory use.

COOPERATION WITH STATE INSTITUTIONS.

As heretofore, this Division has attempted to secure the fullest possible cooperation with the State experiment stations, boards of agriculture, and geological surveys. Such cooperation has been particularly close and satisfactory and mutually beneficial with the Maryland Geological Survey, Maryland Agricultural Experiment Station, the North Carolina Department of Agriculture, the Utah Agricultural Experiment Station, and the Arizona Agricultural Experiment Station. Other institutions have helped in various ways in the preparation of plans and the securing of base maps.

PUBLICATION OF THE REPORTS AND MAPS.

The Fifty-sixth Congress, second session, provided by joint resolution, approved February 23, 1901, for the publication annually of a "Report of the field operations of the Division of Soils." In accordance with this, the report of the field work for 1900 was prepared and transmitted to the Public Printer about March 1, 1901. Under the contract let by him for the lithographic work on the maps, these were to be delivered not later than September 1; but on July 4 the lithographic establishment where they were being prepared was destroyed by fire. Fortunately, the work had progressed so far that records of all the work were preserved; nevertheless, the publication of the report will necessarily be delayed, and it can hardly appear before the end of the calendar year.

As the work of the Bureau extends it is doubtful if the publication of all the results of the field operations in one volume will be either feasible or economical; but this is a matter which can hardly be determined at this time.

EXPENSES OF THE WORK DURING THE FISCAL YEAR.

Having said so much of the results that have been attained in the several lines, it will be of interest to report upon the cost of the work, to show that the money appropriated was wisely and economically expended, and that the results could only have been secured by an excellent organization and by efficient and constant work on the part of all the employees of the Division.

The following statement, taken from the financial books of the Division, shows the distribution of the expenditures among the several offices:

Statement of expenditures, year ended June 30, 1901.

Administrative expenses:		
Salaries	$8,538.59	
Supplies	511.63	
Rent	660.00	
Gas	109.50	
Electric current	107.99	
Express and freight	18.19	
Telegrams	22.58	
Engine repairs	113.20	
		$10,081.68
Laboratories:		
Salaries	5,345.70	
Supplies	583.75	
		5,929.45
Tobacco investigations:		
Salaries	4,579.99	
Supplies	12.00	
Traveling expenses	1,017.65	
		5,609.64
Soil survey, Eastern division:		
Salaries	5,776.45	
Supplies	169.85	
Traveling expenses	2,882.58	
		8,828.88
Soil survey, Western division:		
Salaries	5,430.93	
Supplies	264.45	
Traveling expenses	3,697.07	
		9,392.45
		39,842.10

RECAPITULATION.

		Per cent.
Administrative expenses	$10,081.68	25.3
Laboratories	5,929.45	14.9
Tobacco investigations	5,609.64	14
Eastern soil survey	8,828.88	22.2
Western soil survey	9,392.45	23.6
	39,842.10	100

It will be seen from this statement that the expenses of the administrative office, including the salary of the chief and of all the clerks, together with the incidental expenses, amounted to about 25 per cent of the whole appropriation; the laboratories each cost something less than $6,000, or about 15 per cent; the tobacco investigations about $5,000, or 14 per cent, while the soil-survey work took about 46 per cent of the appropriation. In all, upward of 60 per cent of the appropriation was expended for the tobacco investigations and the soil survey, carried on almost exclusively in the field and in a number of States. The amount of work done and the results accomplished, it

is believed, fully justify the expenditure of the money, as well as the reorganization into a bureau and the increase in the appropriation for the work of the new Bureau of Soils.

ADDITIONAL ROOM ACQUIRED.

In my last report I called attention to the impossibility of providing for the work of the Division of Soils without additional room. Congress has accordingly increased the limit for the rent of buildings, and arrangements have been made for the removal of the Division of Vegetable Physiology and Pathology from the adjoining offices, which will then be occupied by the Bureau. While this will provide room for our immediate needs, it has seemed necessary to ask for a further increase in the limit to be paid for rent, as it is likely that larger quarters will be required in the near future.

CLERICAL WORK.

The publications of the Division during the fiscal year consisted of two reports, three bulletins, two Yearbook articles, and one miscellaneous paper, aggregating in all 279 pages. The "Report on the field operations of the Division of Soils, 1900" (473 pages), was completed for the press, but the issue, as already explained, has been delayed. This, added to the above, will bring the total up to 752 pages, against 558 pages last year. Correspondence has largely increased, and about 3,000 replies to letters were sent out. The soil collection was increased by 765 samples during the year, making a total of 5,523 samples, which have all been catalogued; 640 mechanical and 150 chemical analyses were made during the year, and the results catalogued in a convenient form for reference; 463 photographic negatives were added to the collection, making a total of 831, illustrating the soil conditions and problems, all of them having been catalogued. A small library of soil literature maintained by the Division has received 281 volumes and pamphlets during the year, which have been classified and catalogued. The library now contains 1,921 books pertaining to soils. The Division now has 2,652 maps of various kinds, which have been catalogued, a part of them as base maps for possible use in the extension of the soil survey, and part of them as records of soil work in this and other countries.

CONCLUSION.

In presenting this, the last report of the Division of Soils, together with some of the plans for the new Bureau of Soils, it will be allowable to point with just pride to the phenomenal growth of the work of soil investigations from its inception six years ago as a subordinate division of the Weather Bureau into a bureau of itself, well organized and equipped to carry on the larger sphere of work made possible by the increased appropriation; also to contemplate with considerable satisfaction the results accomplished, especially in this last year, with a very moderate expenditure of the public funds. The work has received a very general and cordial appreciation, and has met the supreme test of the Department, practical utility and material benefit to the tiller of the soil. Nor can I conclude without warm words of commendation for my principal assistants and their subordinates and an acknowledgment of the zeal and energy with which each one has contributed to the success of the year's work.

REPORT OF THE ENTOMOLOGIST.

U. S. DEPARTMENT OF AGRICULTURE,
DIVISION OF ENTOMOLOGY,
Washington, D. C., August 10, 1901.

SIR: I submit herewith an executive report covering operations in the Division of Entomology for the fiscal year ended June 30, 1901, dividing it, in accordance with the directions contained in your circular letter of July 8, into the following sections:

(1) A brief review of the operations carried on during the fiscal year 1901.

(2) An outline of the plans proposed for the work of this Division for the fiscal year 1902, under appropriations already made for that year.

(3) Suggestions as to work recommended for the fiscal year ending June 30, 1903, for use in preparing estimates.

Respectfully,

L. O. HOWARD,
Entomologist.

Hon. JAMES WILSON, *Secretary.*

WORK OF THE YEAR.

The amount appropriated by Congress for entomological investigations (aside from salaries appropriated for by the statutory roll) was $22,500. Out of this amount there was expended the sum of $22,206.76, leaving an unexpended balance covered into the Treasury of $293.24. The main items of expense may be grouped as follows: Salaries of investigators and other employees, stationed for the most part in Washington, D. C., $16,384.59; salaries of field agents, $913; miscellaneous office supplies and expenses, $2,327.64; traveling expenses, $2,184.33; illustrations, $397.20. Of the salaries for employees, the amount expended for expert scientific assistants has been $12,144.59, and for clerical and other assistants, $4,240.

The work of the Division may be classified, as in former years, under the following heads:

(*a*) Investigations upon specific injurious insects or groups of insects.

(*b*) Experimental work with remedies.

(*c*) Determination of specimens sent in by the entomologists of the State experiment stations and by other workers.

(*d*) General investigations of the life histories of injurious insects.

(*e*) Work on the geographical distribution of the injurious insects of the United States.

(*f*) Bibliographic work.

(*g*) Preparation of circulars of information.

(*h*) Correspondence.

(*i*) Work upon the exhibit of insects for the Pan-American Exposition.

(*j*) Work in apiculture.

Briefly summarized, the work of the Division under each of these heads has been as follows:

(*a*) INVESTIGATIONS UPON SPECIFIC INJURIOUS INSECTS OR GROUPS OF INSECTS.

WORK ON INSECTS FROM ABROAD.

The most striking result in this branch of work which has been achieved has been referred to in its different stages of progress in the last two reports. This is the introduction and establishment of the fig-fertilizing insect (*Blastophaga grossorum*) from Algeria into California, where it was practically used for the fertilization of the large orchard of Smyrna figs at Fresno. An assistant was sent to Fresno in the spring of 1900, and remained there throughout the season, making observations which completely cleared up the life history of the insect and resulted in the ascertaining of important facts previously unknown, although in southern Europe the insect had been known and studied for very many years.

This assistant also took active part in the practical work of handling the insect and fertilizing the Smyrna fig crop. The results exceeded the most sanguine expectations. A very large crop of Smyrna figs was raised, dried, and placed upon the market in the autumn of 1900. Tests made by chemists and by fruit experts showed that not only were these California-raised Smyrna figs fully equal to the imported product, but that they contained a larger percentage of sugar. In the opinion of those well qualified to judge, they possessed a superior flavor and were cleaner and more attractive in general appearance.

The experience gained during the summer and autumn of 1900 enabled the work, during the spring and early summer of 1901, to be carried on to much better advantage. The insect hibernated successfully, in many instances without artificial shelter over the trees, and the prospects for the crop of the season of 1901 at Fresno indicate that the output will be more than four times as great as that of the summer of 1900, and last year's experience in preparation for the market will improve the quality of the product.

The fertilizing insect has been thoroughly established at Niles, Cal., where observations have been carried on throughout the whole fiscal year by agents of the Division, and it has also been established at several other points. The Division holds itself in readiness to furnish a supply of the insects to any fig grower after he has succeeded in raising to the bearing stage caprifig trees and Smyrna fig trees.

Mr. George C. Roeding, the proprietor of the large orchard at Fresno, went to Smyrna in the spring of 1901 for the purpose of studying the methods in use in that country, under commission from this Department. A full account of the work done and the results obtained down to the close of the calendar year 1900 was published in an article by the Entomologist in the Yearbook of the Department for that year, and since that publication, continued work has been done, the California operations having been carefully followed. It is perfectly safe to state at this time that a new horticultural industry of great future value to the country has been firmly established.

In the last report mention was made of the introduction from South Africa of an important and desirable parasite known as *Scutellista cyanea*, which attacks the black scale, a destructive insect in the olive and orange groves of California. These specimens were secured through the courtesy of Mr. C. P. Lounsbury, the entomologist of Cape Colony. They were received June 8, 1900, and were at once expressed to Santa Clara County, Cal., where Mr. E. M. Ehrhorn was prepared to care for them. On August 16 a new generation made its appearance in California, sixty days from the time of the arrival of the survivors of the journey from Africa. These were reared on a covered oleander plant, and were divided and placed upon several other covered plants infested with the scale. They bred up to the appearance of the cold weather. Before the close of the season colonies were placed in several orchards infested with black scale outdoors, while other colonies were retained under cover. Up to February 24 nothing further was noticed in the way of living specimens, nor was it seen during the following spring and early summer months. It is a very small insect, however, and it may exist at large in the olive orchards. Scale-infested branches have been collected at intervals and placed in breeding jars, but nothing has been bred from them. Further introductions will be made, and establishments will be tried at points farther south than San Jose.

There can be no doubt that this parasite is a very effective enemy of the black scale in South Africa, and, in fact, it has been rather difficult to find enough scales to propagate the parasites for shipment to this country.

Strong efforts were made during the year to import, in living condition, European enemies of the Gipsy moth. The cessation of the extermination work, which had been carried on for several years against this insect by the State of Massachusetts, created, for the first time, a favorable opportunity for these attempts. The Division has placed itself in correspondence with several European entomologists, and two consignments of European predatory beetles (*Calosoma sycophanta* and *C. inquisitor*) have been received through the kindness of Dr. Paul Marchal, of Paris, and Captain Xambeu, of Pyrenées Orientales; but although the greatest care has been taken in packing, not one living specimen has as yet reached Washington. The attempt is being continued, and, with little doubt, some successful method of introducing these beneficial species will be ascertained. This is the first attempt which has been made to introduce insects of this family (*Carabidæ*) across the ocean, and on account of the fact that they are great cannibals and very active insects, the introduction is especially difficult of accomplishment. Meantime, the Gipsy moth is spreading far beyond its old boundaries in New England, having reached Providence, R. I., the present year; and another important insect, the brown-tailed moth, which will also be attacked by these European predatory species, has become so numerous in eastern New England as to attract very general attention. There is, therefore, every reason for active efforts to bring about the establishment of their European natural enemies.

Bearing upon international work, although not strictly coming under this head, the introduction of the South African locust fungus was briefly referred to in the last report. During the winter of 1901 additional culture tubes of this fungus, which was stated to have been so successful in destroying the South African grasshoppers or locusts, were received through the kindness of Dr. Eddington,

of the bacteriological laboratory at Pietermaritzburg, Natal, and the veterinary branch of the Department of Agriculture at Cape Town, and by cooperation with the bacteriological laboratory of the Bureau of Animal Industry of this Department the Division was able to secure a large number of subcultures, which, during the early summer of 1901, were distributed to many correspondents in the Western States in localities where grasshoppers appeared in enormous numbers. In all, something like 190 tubes were distributed, with full directions for their use, and with directions for preparing subcultures in the field. Owing to the extreme drought, the majority of the experiments were unsuccessful. One locality in Colorado reports great success, three localities in Nebraska report excellent results, and one in New Mexico and one in Texas also report a reasonable amount (more or less) of success. At the time of this writing reports are still coming in, and the subject will be treated in detail in the Yearbook of the Department for 1901.

WORK ON GARDEN AND GREENHOUSE INSECTS.

Investigations begun in previous years on insects of these classes have been continued. A successful investigation of two very important species—the fall army worm and the variegated cutworm—has been completed, and the results will be published in Bulletin No. 29 (new series).

An important publication has been prepared and issued on the insects injurious to the violet, rose, and other ornamental plants, a subject which had never before received competent and specific consideration from economic entomologists.

A technical bulletin (No. 8, technical series) was published during the year, which treats monographically of the red spiders and white flies of the United States, two groups of insects abundant and injurious in greenhouses and in the field.

WORK ON SCALE INSECTS.

Extensive work on these very important insects, which have gained such prominence in the horticultural world since the advent of the San Jose scale into the Eastern United States, has been carried on. This work has been largely of a systematic kind, although much experimental work with remedies has also been conducted. Scale insects have been sent to the office from all parts of the country, in fact from all parts of the world, for examination, and a monographic work upon the most destructive species is in preparation. Circular No. 42 (second series), on how to control the San Jose scale, has been published as the result of the remedial experimental work. Owing to the fact that fruit exporters of this country have been greatly hampered by the regulations passed by various foreign Governments alarmed at the prospect of introducing the San Jose scale, there has been a demand from these people for condensed and plain information as to the exact effect of these foreign regulations. There was therefore prepared and published during the year a circular entitled "Regulations of foreign Governments regarding importation of American plants, trees, and fruits," which has been distributed as widely as possible among American exporters of these products.

Ever since the appearance of the San Jose scale in the United States the question of its original home has been a mooted one; and since none of the parasitic and predatory insects of this country seem to be very efficient in destroying this scale, it has become an important

point to decide, if possible, the question of the original home of this scale, since this original home once found, it is quite fair to suppose that there also may be found efficient parasites. The evidence accumulating during the past two or three years has pointed quite strongly toward Japan, and in the spring of 1901 a competent assistant, Mr. C. L. Marlatt, was sent to Japan for the purpose of studying this question upon the ground. Unexpectedly to most entomologists in this country, although not to the writer and to the investigator, it has been quite definitely ascertained that the San Jose scale is not indigenous to Japan, but that, quite to the contrary, it was introduced into that country from the United States upon fruit stock. Nevertheless, an allied scale, known in this country as the West Indian peach scale, has been found to be indigenous in Japan, and to possess efficient natural enemies which also prey upon the San Jose scale. An attempt is being made to introduce these natural enemies into this country, and further efforts will be made, by continuing the journey, to find in oriental regions the true original home of the San Jose scale.

INSECTS AS CARRIERS OF DISEASES OF HUMAN BEINGS.

This subject of investigation, while, perhaps, it may be considered only indirectly agricultural, comes distinctly within the province of this Division, since it is the only governmental institution concerned with work in economic entomology; and, also, anything which relates to the health and well-being of agricultural classes is agricultural. Aside from their disease-bearing relation, mosquitoes are in part responsible for the nonavailability of large tracts of land of great agricultural possibilities.

As a consequence, much attention has been paid to the general subject of mosquitoes, especially in their relation to disease and in the search for the most efficient remedial measures.

In August, 1900, a comprehensive bulletin was published dealing with North American mosquitoes, which has been used extensively by physicians in different parts of the country as a guide in distinguishing all those which carry malaria, as well as those which have probably no disease relation, and in learning about the breeding places of the former. It also dealt largely with the subject of remedies. Investigations of the office on the subject of mosquitoes were carried on throughout the year. Advice was given by correspondence to many communities and organizations of individuals engaged in anti-mosquito work, and in cooperation with the Division of Soils some work was done looking toward the reclamation of brackish marshes, which are great breeding places of mosquitoes.

There was completed during the year an investigation of the insects breeding in or attracted to human excreta, for the purpose of determining what flies may be safely said to take part in the dissemination of typhoid fever. These results have been published in full, and will be summarized in Bulletin No. 30 (new series) of the Division of Entomology, and a short article on the general subject of insects as carriers of disease will be published in the Yearbook for 1901.

WORK UPON INSECTS DAMAGING FORESTS.

The investigation undertaken for the Division by Dr. A. D. Hopkins in the spring of 1901 upon the insects injuring forests in northern New England was completed, and a bulletin describing the results is now in press, and will appear as Bulletin No. 28 (new series).

WORK ON THE CODLING MOTH IN THE NORTHWEST.

Apple culture having become very important in the States of Idaho, Washington, and Oregon, and the codling moth having been accidentally introduced into those States, it has become apparent in the last few years that the remedial measures which have been so successful against this insect farther east are for some unexplained reason by no means so successful in the far Northwest. Therefore, upon the receipt of petitions from fruit growers from all three of the States mentioned, an investigation was begun in cooperation with the official entomologists of the respective State agricultural experiment stations. An agent of the Division spent the summer of 1900 in Idaho, ascertained many important facts, and outlined a course of procedure which if carefully followed will alleviate present conditions. This report will be published in Bulletin No. 30 (new series) of this Division. The same agent took the field again in the early summer of 1901, and the investigation will be followed throughout the season.

WORK ON THE MEXICAN COTTON-BOLL WEEVIL.

In the spring of 1898 the work which had been done by the Division in 1896 and 1897 against this insect was stopped. The State legislature of Texas made an appropriation providing for a State entomologist, and since a competent man was appointed and furnished with means for investigation, it was considered desirable to devote the funds of the Division to investigations not otherwise provided for. During the winter of 1900–1901, however, it appeared from the reports of the Texas entomologist, Prof. F. W. Mally, that the weevil had spread widely beyond its original range and beyond the limits to which it was supposed it might be confined. The problem, therefore, became one of broad interest, since the insect had already reached within 100 miles of the Louisiana border, and had doubled its northward range from the mouth of the Rio Grande. Other cotton States are therefore threatened. The Texas authorities appealed to the Division for cooperation, and Congress made a special appropriation for a thorough investigation of this particular insect by this office. This appropriation did not become available until the beginning of the fiscal year 1901–1902, but the emergency seemed so great that an especially qualified expert was sent into the field in March, 1901, his salary and expenses being paid from the general fund of the Division, and he worked conscientiously and successfully for the remainder of the fiscal year. The investigation will be continued throughout the next fiscal year.

WORK ON INSECTS INJURING CITRUS TREES AND FRUITS.

An assistant was stationed in southern California throughout the summer of 1900, as mentioned in the last report, and conducted an extensive series of observations upon insects injurious to the orange, the lemon, and other citrus fruits in that part of the country. His work included not only studies of the insects, but experiments with remedies against the injurious species. The results of this investigation are included in an article entitled "The scale insect and mite enemies of citrus trees" in the Yearbook of the Department for 1900.

OTHER INVESTIGATIONS.

The work against injurious grasshoppers in the State of Mississippi, mentioned in the last report, was continued through the summer of

1900 by an agent of the Division, and the results will be published in Bulletin No. 30 (new series). As a result, probably mainly of the work done, but undoubtedly also of the work of natural enemies and changed weather conditions, no complaint has been made the present summer of the work of grasshoppers in this locality. Other specific work of this character, but of less importance, has been carried on in many directions, and will probably achieve results worthy of special mention at a later date.

(*b*) EXPERIMENTAL WORK WITH REMEDIES.

The work outlined in the last report has been continued. Many substances have been experimented with. A number of disputed claims as to insecticidal values have been set at rest. The lime, sulphur, and salt wash, so successfully used in California against scale insects on deciduous trees, but which had previously been found unsuccessful in the East, has been again experimented with under different conditions, and has been found to be very successful wherever the weather conditions happened to be very favorable, duplicating in a measure the conditions on the Pacific coast. The general subject of insecticidal measures, after extensive experimentation, has been covered in Farmers' Bulletin No. 127, issued February 6, 1901, and for which there has been great call from agriculturists and horticulturists. It is a detailed treatise of the more important insecticides, with directions for their preparation and use. The results of a large series of experimental tests will be published in Bulletin No. 30 (new series) of the Division.

Experimental work with fumigants has also been carried on, and some important experiments have been made in the way of fumigating bake shops and granaries against grain insects, and tobacco establishments against the tobacco beetle, or "cigarette beetle," as it is sometimes called. A lengthy series of insecticidal operations was carried on by the first assistant in southern California, which were reported upon in the Yearbook of the Department for 1900.

(*c*) DETERMINATION OF SPECIMENS SENT IN.

As reported in previous years, the different experts in the Division have been obliged to devote much of their time to the naming of specimens for experiment station entomologists and others who have not access to large collections, either of specimens or of books. The fact that the Division is obliged to name specimens for entomologists of the experiment stations is by no means derogatory to these station officials, since the field of entomology is so great that one man can hardly have expert knowledge of the highest character of more than one of the large number of groups of insects. The office force of the Division, however, is composed of a number of such experts, and entomologists working single-handed are practically obliged to consult them. This work, as has previously been pointed out, although excessive, makes no showing in the practical output of the Division. It is indirectly, however, of much practical value as facilitating the work of station entomologists.

(*d*) GENERAL INVESTIGATIONS OF THE LIFE HISTORIES OF INJURIOUS INSECTS.

During the fiscal year life-history notes were made upon 154 species of insects which had not before been studied in the insectary. The catalogue number of the biological series so studied reached 9,441 on

June 30, 1901. This means that in the divisional work, from 1881 to date, 9,441 species of insects have been studied in confinement in an effort to learn their full life histories in order to judge of their economic importance, and if injurious to determine the best point of attack.

(*e*) WORK ON THE GEOGRAPHICAL DISTRIBUTION OF THE INJURIOUS INSECTS OF THE UNITED STATES.

This work has been carried on during the year. A number of maps have been brought down to date and are already found to be most useful in the work of the Division. It is hoped that before long maps of the distribution of the most prominent injurious species will be ready for publication, and so be available to other working entomologists.

(*f*) BIBLIOGRAPHIC WORK.

Part VII of the "Bibliography of the more important contributions to American economic entomology" was published in November, 1900. It brings the bibliography down to January 1, 1900, and completes to that date a work which is unique and of the greatest value to all persons writing upon the subject of injurious insects.

There was also published in this line, as Bulletin No. 24 (new series) of the Division, a list of works on North American entomology, compiled for the use of students and other workers, and which includes such titles as those of synopses, catalogues, and lists, arranged under the different groups of insects, thus enabling the worker who wishes to determine species to learn readily just what works to consult.

(*g*) PREPARATION OF CIRCULARS OF INFORMATION.

Many of these useful circulars, which have been of the greatest assistance in the way of reducing the bulk of the correspondence by presenting in concise form the information most frequently asked for by persons seeking remedies for injurious insects, have been reprinted, and three additional numbers have been published during the year.

(*h*) CORRESPONDENCE.

The correspondence of the office has been greater than ever before in the history of the Division. About 8,500 letters were written during the year in answer to inquiries regarding injurious insects, and many others were answered by printed or mimeographed circulars.

(*i*) EXHIBIT OF INSECTS AT THE PAN-AMERICAN EXPOSITION.

Although the space allotted to the Division in the Government building was very small, an instructive exhibit was sent on, comprising two parts. The first class, insects injurious to agricultural and horticultural industries in the Northeast, was contained in 28 trays, and comprised specimens of the insects and their work, with enlarged illustrations of those which are too small to be easily made out by the naked eye. Those of the second class were contained in 24 trays, and illustrated very completely the insects which damage forest trees in Northern United States, showing not only the insects themselves, but excellent examples of their work in wood and under bark, as well as on other portions of the trees.

It is the experience of the Entomologist, and he knows by conversa-

tion with persons in charge of other branches of scientific work under the Government, that these annual expositions are and will continue to be serious hindrances to the specific work appropriated for by Congress, so long as special funds for the preparation of exhibits are not sufficiently large to enable the employment of additional specialists for exposition purposes alone. The work of this office and of other offices is interrupted every year by the necessity of preparing such exhibits, and time is spent for this purpose which is intended by the Government, under direction of Congress, for entirely different purposes.

(*j*) WORK IN APICULTURE.

Further comparative tests have been made of Carniolan, Italian, and Cyprian bees, with crosses of the first and last. Practical tests of methods employed in rearing queen bees have been made, and original devices facilitating production of queens have been developed. Successful experiments in the sending of queen bees by mail have been made, and additional data concerning honey-producing plants have been collected. The correspondence in this branch of the work has been constant and extensive.

PROPOSED WORK FOR THE FISCAL YEAR 1902.

Work for the fiscal year 1902, which at the date of this writing is already well under way, will be carried on in the same directions as the work during the past fiscal year. Investigation of the codling moth in the Northwest, as authorized by Congress, will be continued. The work against the Mexican cotton-boll weevil in Texas will be carried on through the whole year, one or more agents being employed specially for the purpose. The South African grasshopper fungus will receive a severe practical test, and the native diseases of Western species will also be studied. The year promises to be one of very considerable injury from different species of grasshoppers, and a study of the conditions under which these abnormally numerous local swarms have developed will be made by an expert. The search for the original home and natural enemies of the San Jose scale will be continued in Oriental regions by one of the assistants. An investigation will be made, at the request of the Cuban government, into damage done by insects to the cocoa palm in the province of Santiago, and an assistant has already been sent to the island for that purpose. Extensive experimental work with remedies will be continued, and the general investigations of insects injurious to garden and field crops and to shade and forest trees will also be continued. The extreme interest which is being taken in the mosquito question by many communities indicates that much advisory work must be done by this office, and experts will be sent from time to time to such communities to point out the best methods of procedure, while it is hoped that the Bureau of Soils will continue to cooperate in the work of reclaiming mosquito-breeding swamp tracts.

In apiculture, owing to the fact that Congress has for the first time made a specific appropriation for this work, the Division will undertake the importation and distribution of a limited number of Italian, Carniolan, and Cyprian queen bees, also the breeding of select queens of these races and various crosses between them, for distribution and comparative tests in different parts of the country, especially by the State agricultural experiment stations. The study of honey-producing plants will be continued, and maps will be prepared showing the distribution of the most important. Finally, practical tests of various

original devices connected with queen rearing will be made, and the results will be published. It is proposed to make a study of certain features of the bee-keeping industry in Florida, Texas, New Mexico, Arizona, and southern California, and experiments will be carried on to develop a safe and cheap method of wintering surplus queens. An effort will also be made to collect information regarding the honey resources and other conditions affecting bee keeping in Porto Rico, Hawaii, Alaska, and the Philippines.

SUGGESTIONS AS TO ESTIMATES FOR THE YEAR 1903.

I recommend that all of the appropriations made for the year 1902 be continued for the year 1903, with an increase in one item only and the addition of another item. The investigation of the Mexican cotton-boll weevil is one of such potential importance to the cotton-growing industry that it is obvious that no effort should be spared to find a practical and cheap means of fighting this destructive insect. The work of the summer of 1901 and of the spring of 1902 will not settle the question. Many points will still remain to be set at rest. Therefore the reappropriation of $3,500 for this investigation is urged. The same may be said of the appropriation of $1,000 for the investigation of the codling moth in the Northwest, with a view of ascertaining the best remedial measures to be adopted in that section of the country.

With apiculture, it seems very desirable that the appropriation should be increased. The $2,000 appropriated for 1902 is sufficient to pay a small salary to one expert, leaving a very small amount for the expenses of the investigation work. The bee industry is such a large one in this country, and its possibilities seem so extensive, that it appears well worth while to comply with the earnest desires of the large and growing body of bee keepers and to conduct some practical scientific work which will be of assistance to them. There is a great necessity for a thorough investigation of the contagious diseases of bees. Whole apiaries in some sections of the country have been completely destroyed by maladies about which nothing is known. Our extensive correspondence shows that there is a constantly increasing demand for information as to the possibilities of bee keeping in this country and in our recently added territories. The large bees of Oriental regions (*Apis dorsata*) should be studied in the Philippines and, if found possible, should be introduced into our Southern States. The apicultural product of the country at present is estimated at $20,000,000 annually, but this is but a small part of the benefits which the country as a whole derives from this industry, since the yields of fruit and seed crops are largely increased by the presence of bees in numbers, this increase being brought about by cross fertilization through the agency of the bees. I therefore recommend that the appropriation be raised from $2,000 to $5,000 for the fiscal year 1903.

There has been for several years past a rapidly increasing demand for information regarding the destruction of forest trees by insects. This destruction in certain sections has been so great as to amount to serious loss. The Division, through publications and correspondence, has endeavored to supply the demand for information in regard to insects of this class, but the knowledge at hand is not commensurate with the situation, and a careful and extended investigation is urgently needed and is called for by the great forestry industries of the country. I therefore strongly urge that $5,000 be appropriated for the fiscal year 1903 for the investigation of damage to forests and forest trees by insects.

REPORT OF THE ACTING CHIEF OF THE DIVISION OF BIOLOGICAL SURVEY.

U. S. DEPARTMENT OF AGRICULTURE,
DIVISION OF BIOLOGICAL SURVEY,
Washington, D. C., September 30, 1901.

SIR: I have the honor to submit herewith a report of the work of the Biological Survey for the fiscal year ended June 30, 1901, with outline of work for 1902, and recommendations for 1903.

Respectfully,

T. S. PALMER,
Acting Chief.

Hon. JAMES WILSON, *Secretary.*

WORK OF THE YEAR.

At the beginning of the year the assumption of the varied duties connected with carrying out the act of May 25, 1900, commonly known as the Lacey Act, necessitated some reorganization of the work of the Biological Survey. The Division is now practically divided into three sections, the work being distributed as follows: (1) Biological surveys and investigations of geographic distribution of mammals and birds—under the immediate charge of the chief of the Division; (2) investigations to determine the economic relations of birds—in charge of Prof. F. E. L. Beal; (3) supervision of matters relating to protection of game and importation of foreign birds and animals—in charge of the assistant chief.

FIELD WORK.

During the year the field work necessary in making biological surveys and in investigating the distribution of mammals and birds was carried on in four States and Territories—California, Texas, Alaska, and New Mexico; also in Yucatan, Mexico; and in Athabasca, Keewatin, and Mackenzie, Canada. In several of these regions the work was a continuation of that begun several years ago. The biological survey in California, outlined in the report for last year, was conducted chiefly in that part of the Sierra Nevada lying between Lake Tahoe and the Yosemite Valley. Some work was also done in the northern Sierras between Beckwith Pass and Oroville, in the Coast Range near Mount St. Helena, and, during the spring of the present year, near Baird, Shasta County. The plans for this season contemplate a resumption of the work in the Sierras from July to October.

The work outlined for Alaska, in charge of W. H. Osgood, was restricted to the region about Cook Inlet. A report on this expedition has been completed for publication as North American Fauna No. 21.

For several years past field work has been progressing in the Southwest, with the object of making a comprehensive survey of the State

of Texas. It has now reached such a stage that probably by the close of this season sufficient data will have been secured to warrant the publication of a preliminary report. The field parties, as heretofore, were in charge of Vernon Bailey, chief field naturalist. The section of the State covered this year included a line from San Angelo to the Pecos River and the region west of the Pecos from the Rio Grande to the New Mexican boundary. The higher mountains lying within this region, such as the Chisos, Davis, and Guadalupe ranges, which vary in altitude from 8,000 to 9,500 feet, and the summits of which are covered with coniferous forests, received particular attention. The Chisos Mountains, a detached range near the Rio Grande, proved to be of especial interest, since they were found to be inhabited by several Mexican species which had not been previously detected in the United States. Some work was also done in northern Texas and in New Mexico, with a view to filling gaps in the field work of previous seasons. The investigations in Mexico, in charge of E. W. Nelson, were continued, the State of Yucatan being the field of operations. Several points in the interior were visited, and a trip was made to the island of Cozumel on the east coast. Important collections of mammals and birds were secured, among which those from Cozumel are of special interest.

The explorations in the Hudson Bay region, outlined in the last annual report, were successfully carried out by Edward A. Preble. The party visited several of the Hudson Bay posts and succeeded in penetrating to a point some distance north of Fort Churchill on the west side of Hudson Bay. The specimens collected have been partially examined, and a report on the trip is now in course of preparation. A similar trip was planned for the spring of 1901, and the party left Edmonton, Alberta, about May 1, with instructions to proceed northward by way of Athabasca River to Great Slave Lake, making stops at several points along the route. The material gathered on these two expeditions will be of unusual interest, not only in the study of the distribution of species occurring along the northern border of the United States, but also for comparison with the material obtained in similar field work in southern Alaska. Mention should be made of the cordial cooperation on the part of the Hudson Bay Company in arranging for these two trips and in furnishing means of transportation. Without this cooperation it would have been impracticable for the field parties to have penetrated far into the regions to which they were assigned.

ECONOMIC RELATIONS OF BIRDS.

The total number of bird stomachs in the collection June 30, 1901, was 36,780, an increase of 2,483 over the number that had been received to June 30, 1900. Of these, 2,236 were examined during the year as against 1,989 examined during the previous year. The number of stomachs examined in each of the principal groups was as follows:

Thrushes	641	Flycatchers	141
Titmice	326	Swallows	125
Sparrows	297	Miscellaneous	262
Orioles	224		
Woodpeckers	220	Total	2,236

The data obtained from the examination of the 297 sparrow stomachs were utilized in the report on the food of sparrows which has been in course of preparation for several years but is now completed. Spe-

cial attention has been paid to the food of orioles, woodpeckers, flycatchers, and swallows, with a view to supplementing former reports in the case of the first two groups and preparing preliminary reports in the case of the last two.

More than 25 per cent of the stomachs were examined in connection with the preparation of a report embodying the recent field investigations conducted by Dr. S. D. Judd, which will shortly appear.

Numerous complaints have been received during the past few years concerning the damage done to fruit on the Pacific coast by the house finch (*Carpodacus mexicanus frontalis*), blue jay (*Aphelocoma californica*), western robin (*Merula migratoria propinqua*), and other birds. In May of the present year Prof. F. E. L. Beal was dispatched to California to visit the principal fruit-growing sections of the State and to make a personal investigation of the depredations in the orchards. Professor Beal first made his headquarters at Haywards, Alameda County, studying the conditions in the various fruit-growing sections about San Francisco Bay, observing the birds at the time when the fruit was ripening, and collecting material for study in the laboratory. He also visited southern California and the orchards and vineyards in the vicinity of Fresno in the upper San Joaquin Valley. The data obtained through these investigations will throw much light on the economic status of the birds studied in California, but the amount of material thus far received indicates that several months will be required for its examination and the preparation of the results for publication.

THE LACEY ACT.

In carrying out the provisions of the Lacey Act the Department has been brought into close relations with several of the other Executive Departments, with State officials, and with game-protective associations throughout the country. Four of the Executive Departments are now cooperating in the enforcement of this law—the Treasury Department in carrying out regulations for the importation of foreign birds and animals, the Department of the Interior in preventing illegal shipments of game from the Indian Territory, the Department of Justice in prosecuting violations of the Federal statute, and the Department of Agriculture in assisting in the enforcement of the law, issuing permits for the entry of foreign birds, and collecting and disseminating information concerning birds and game.

In the absence of an adequate appropriation, which would admit of carrying out all the provisions of the law, the Department has devoted its attention largely to the educational side of the work as the one likely to yield the best results in proportion to limited expenditures. In pursuance of this policy information concerning game laws has been collected and published in the form of popular bulletins, and aid has been freely rendered to all efforts to arouse public interest in the protection of birds and game. In the publications the more important details of the various State laws have been arranged in a form convenient for comparison, and a comprehensive definition of game, a uniform plan of stating close seasons, and a regular sequence of treating of the various kinds of game have all been adopted. These details tend to simplify many of the complexities of game legislation. The demand for the published bulletins and for special information on game protection has been unexpectedly large and is increasing to such a degree that it is becoming more and more difficult to meet all requests. The interest in bird protection aroused through the passage of the

Lacey Act has extended to all classes and to all sections of the country. Never before has so much attention been given to game legislation, and intelligent interest in the subject has been clearly exemplified in the numerous improved game laws enacted at the recent sessions of the State legislatures. Efforts have been made to place the subject on a higher plane and to secure greater uniformity in the laws of adjoining States. In several instances these efforts, in which national organizations have cooperated with State legislatures and officials, have met with marked success, as shown by the enactment of a practically uniform law for the protection of insectivorous birds in eight States and the District of Columbia. Greater uniformity confers a twofold benefit: It makes the State laws far more effective and it strengthens the Federal statute which rests upon these local laws as a basis. Thus, it can safely be said that the Lacey Act has been materially strengthened as a result of the legislation of 1901.

ADDITIONAL GAME-PROTECTIVE LEGISLATION NECESSARY.

The Federal statute has not only been the means of giving greater efficiency to local laws, but it has brought to light many weak points in both Federal and State laws which should be remedied by further legislation. Especially is this true of the Federal statutes relating to Alaska, the Indian Territory, and the forest reserves. Alaska has practically no game law; the Indian Territory is protected only by a statute enacted in 1832 which fails to meet modern requirements; and the forest reserves are greatly in need of a law which will either make them game preserves or provide for the establishment of game refuges in certain parts of the reserves suitable for this purpose. These Territories and reservations constitute the natural ranges of most of the big game now remaining in the United States, and with adequate legislation may be made the means of preserving certain species indefinitely.

IMPORTATION OF FOREIGN BIRDS AND ANIMALS.

With the cordial cooperation of the Treasury Department a system for keeping account of and exercising control over wild animals and birds imported from foreign countries was devised and put into operation at the beginning of the fiscal year. Under this system, permits issued by the Department of Agriculture must be presented to the proper customs officers at the port of entry before the animals or birds can be admitted. Large shipments and those containing species whose identity is in doubt are subject to examination by special inspectors, and quarterly reports of actual entries from customs officers, transmitted through the Treasury Department, furnish a check on the operation of the law.

In view of the fact that the law was unknown to many importers at the time it went into effect, that the importations were often made at remote ports of entry, and that in many cases a delay of a few hours might have meant serious loss in the case of tropical animals arriving at northern ports during the winter, it is gratifying to note that only one or two complaints have been received of losses due to delay, and that for these the Department was not responsible. Everything possible has been done to facilitate prompt entry. Arrangements have been made by which permits may be had on telegraphic request, so that within an hour after the receipt of the request the collector of

customs at any port of the United States can be notified that the permit has been issued. Special inspectors, who can, when necessary, examine consignments immediately upon arrival, have been appointed at six of the most important ports, viz, Boston, New York, Philadelphia, Baltimore, New Orleans, and San Francisco. Finally, the list of species which may be imported without permits has been materially extended. During the first three months after the law went into operation permits were required for practically all foreign animals, birds, and reptiles. On September 13, 1900, however, an order was issued by the Secretary of Agriculture, which exempted on and after October 1, 1900, 30 of the largest and best known animals, 3 well-known groups of birds, and all reptiles. The object of this order was to avoid the trouble and annoyance incident to securing permits for the importation of well-known harmless species. It was intended that this list should include no species that could not be identified without the aid of experts, but as a few animals requiring permits have been brought in under the names of one or two species in the excepted list, further slight modifications may be necessary.

During the year 186 permits were issued, covering the entry of about 350 mammals, 10,000 birds, and 38 reptiles. The reptiles include only those arriving during the first three months of the fiscal year, and the number of mammals is much smaller than it would be had there been no order of exemption. Among the birds were 626 pheasants, 4,237 quail, about 1,000 other game birds, and 4,147 cage birds. Among the importations of special interest may be mentioned a young giraffe from west Africa, several chimpanzees, and some Cuban flamingoes.

The numbers given are somewhat in excess of actual importations. Applications for permits frequently contain merely estimates of the number of animals or birds expected, and, through deaths en route or failure on part of foreign agents to fill orders, the number actually arriving in any consignment is apt to fall short of that designated in the permit.

The law has accomplished the main object for which it was enacted, namely, the exclusion of the mongoose and similar pests. Moreover, through its enforcement certain important information has been obtained regarding the importation of live game birds and of cage birds for exhibition. It appears that a considerable trade in Old World pheasants is conducted with the Province of Ontario, the birds being imported chiefly by way of Detroit and Niagara Falls; there is also a regular trade in live Chinese quail at the port of San Francisco, where more than 4,000 birds from Hongkong were brought in for market purposes and sold to Chinese residents of the city between December, 1900, and June, 1901. Cage birds are imported chiefly from Germany, Australia, China, and Japan, through the ports of New York and San Francisco, and many parrots from Mexico and Central America are landed at New Orleans and San Diego.

So far as known to the Department, only 3 specimens of the mongoose were imported during the year. One of these arrived at Philadelphia on the steamer *Urania*, from Jamaica, on May 20. Within twenty-four hours it was killed and deposited as a specimen in the Philadelphia Academy of Sciences. A second mongoose reached San Francisco in June, 1901, and was promptly destroyed. A third was reported from Los Angeles, Cal., in June, but investigation showed that it had arrived several months previously from some port on the Gulf coast, and had died in January. So far as known at present there are no live speci-

mens of the mongoose in the United States, except a few in confinement in zoological gardens. A strict enforcement of existing regulations should effectually prevent the entrance of this or any other pest.

INTERSTATE COMMERCE IN BIRDS KILLED OR POSSESSED IN VIOLATION OF LOCAL LAWS.

During the year numerous cases of violation of game laws have been called to the attention of the Department, of which 57 have received careful investigation. Of those taken up, 8 resulted in conviction,[1] 33 are awaiting action by the courts, 8 are still in the hands of the Department awaiting further evidence, and 8 have been dropped for want of evidence. These cases originated in 12 States and Territories, viz, Arkansas, Indiana, Indian Territory, Iowa, Kansas, Maryland, Missouri, New Jersey, Oklahoma, South Dakota, Tennessee, and Texas, and involved the seizure of 11,940 quail, 974 prairie chickens, 387 miscellaneous game, and 2,608 plume birds, or a total of nearly 16,000 birds. Of the 41 cases acted upon by this Department, 14 were referred to local authorities and 27 were transmitted to the Department of Justice for prosecution in the Federal courts. As a rule, the causes of action have arisen through shipment of birds killed in violation of local laws, and the large proportion of cases still undisposed of at the close of the year is due to the fact that in most instances attention was not called to the offenses until several months after they were committed; moreover it frequently happened that the most important fact—the shipper's name—was unknown, and the Department was called upon to assist in obtaining the necessary evidence, often a very slow and tedious process.

The aid of the Department has been sought in connection with the enforcement of the provisions against illegal shipment of game to a greater extent than was anticipated. Such aid has been freely rendered, though it has been the aim to confine action merely to supplementing the efforts of local authorities, and to refer cases to State authorities for action, whenever possible. The provisions of the law are such that violation of the Federal statute necessarily involves a previous violation of a local law, and it is possible, therefore, to prosecute cases either in local or Federal courts. Whenever conditions have been favorable to success in State courts, or the evidence in the hands of the Department has been such as could be used in a prosecution in such courts, the case has been promptly turned over to local authorities; otherwise it has been referred to the Department of Justice.

In this connection mention should be made of the cordial cooperation of Federal and State officers, as well as railroad and express companies, game protective associations, and various individuals. These have rendered every assistance in their power in the enforcement of the Federal law. Important aid has been received from the State game commissioners or wardens of Illinois, Iowa, Maine, and Michigan, by the American, Pacific, United States, and Wells Fargo Express companies, and by the Game and Fish Protective Association of Maryland, the League of American Sportsmen, and the American Ornithologists' Union.

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[1] Three of these convictions have been obtained since July 1, 1901. Mention should also be made of five other convictions secured in the State courts of Iowa. In these cases the birds were seized in transit and the evidence was referred by the deputy United States marshal directly to the State game warden for action.

Of the cases above mentioned, 54 involved game birds and 3 nongame birds. The first case under the Lacey Act reported to the Department was one involving the shipment of 72 young prairie chickens from St. Louis to Chicago in July, 1900. These birds were shipped under a cipher address, without statement of contents on the package, and were intercepted in transit, so that neither the carrier nor the consignee could be held responsible, and as the shipper could not be located the case was dropped. The first case acted upon by a Federal court involved the shipment of a small package of millinery samples (containing among others 7 gulls and terns) from Brownsville, Tex., to New York City in December, 1900. The shipper was indicted, promptly plead guilty, and paid his fine, and the case was concluded within a few weeks after it was first reported.

A case which perhaps attracted more general attention than any other was one based on information received by the Department in September, 1900. The matter was referred to the local authorities in Baltimore for action, and resulted in the seizure and confiscation of 2,600 plume birds, offered for sale in violation of the State law of Maryland. The case was prosecuted through three courts by the Maryland Fish and Game Protective Association, and the dealer was compelled to pay a fine of $100 and costs. This action attracted widespread attention in the millinery trade, and brought the Department into correspondence with the leading wholesale millinery firms in Eastern cities. The wholesale houses in Baltimore promptly withdrew gulls and terns from sale, and assurances were received from the Millinery Merchants' Protective Association and from leading houses in Boston, New York, Philadelphia, and Baltimore that they would, so far as possible, withdraw from sale and discourage the use of these and other birds protected by local laws.

The effectiveness with which such cases can be disposed of under certain State laws is well illustrated by one instance in which, through the energy of the game warden of Iowa, a conviction was secured and the fine paid within three weeks after the evidence had been forwarded from the Department. Convictions have been secured in a majority of the cases involving illegal shipments from Iowa and the penalty imposed in each of seven cases was a fine of $100 and costs, and in another imprisonment for thirty days.

But the results of the enforcement of the law are not to be measured by the number of prosecutions or by the severity of the penalties imposed. Attention has been called to local laws which had long remained dead letters; the methods of shipping game and the devices resorted to in evading the regulations have been investigated, and information thus secured can be used in preventing similar violations; it has been shown that evidence of illegal shipments that will insure conviction can be obtained a thousand miles from the shipping point and months after the offense is committed; and, finally, it has been demonstrated that shippers are no longer safe as soon as their game has crossed a State boundary.

PUBLICATIONS.

The publications of the year include 2 numbers of North American Fauna (Nos. 18 and 19), 2 bulletins (Nos. 13 and 14), 2 articles in the Yearbook of the Department for 1900, 6 circulars (Nos. 28–33, inclusive), the report of the Division for 1900, and reprints of one of the circulars and three previous publications.

The two numbers of North American Fauna issued were No. 18, "Revision of the pocket mice of the genus *Perognathus*," by W. H. Osgood; and No. 19, "Report of a biological reconnoissance of the Yukon River region," by W. H. Osgood and Dr. Louis B. Bishop. Both of these numbers, as well as Bulletin No. 13, on "Food of the bobolink, blackbirds, and grackles," by Prof. F. E. L. Beal, were mentioned as being in press at the time of the last report. Bulletin No. 14, on "Laws governing the transportation and sale of game," by T. S. Palmer and H. W. Olds, was issued in an edition of 5,000 copies, a number which would have been inadequate to meet the demand had it not been preceded by a 32-page circular (No. 31) containing an abstract of the matter presented in the bulletin, of which circular 15,000 copies were distributed. There is a large demand for publications concerning game, especially on the part of railroad and express companies, and in several instances the Department has received single applications for almost as many copies as were issued in the regular edition. Applicants are usually willing to purchase such reports, but under the present law there is no provision for sales in the quantities desired. As such publications are intended largely for the use of State officials and common carriers in order to secure better enforcement of the game laws, a liberal distribution is advantageous to the Department. An effort has therefore been made to secure as wide a distribution as possible by the preparation of special circulars and tables, which can be issued in large editions at comparatively small cost. The Department is not, however, in a position to meet an unlimited demand, and unless special provision for the purpose is made it will soon be unable to supply many applicants who need the reports and will put them to good use.

The Yearbook articles related to economic ornithology, and were entitled "How birds affect the orchard," by Prof. F. E. L. Beal, and "The food of nestling birds," by Dr. S. D. Judd.

The circulars, six in number, were as follows: No. 28, "Directory of State officials and organizations concerned with the protection of birds and game;" No. 29, "Protection and importation of birds under act of Congress approved May 25, 1900;" No. 30, "Wild animals and birds which may be imported without permits;" No. 31, "Information concerning game;" No. 32, "Directions for the destruction of prairie dogs," and No. 33, "Protection of birds and game—Directory of State officials for 1901."

The original edition (5,000 copies) of circular No. 31 was exhausted almost immediately, and it was necessary to publish reprints to the number of 10,000. Reprints of North American Fauna, No. 16, "Biological survey of Mount Shasta," and bulletin No. 12, "Legislation for the protection of birds other than game birds," were also necessary. Owing to the unabated demand for Farmers' Bulletin No. 54, "Some common birds in relation to agriculture," a tenth edition, of 20,000 copies, was issued during the year, which makes a total of more than 220,000 copies of this bulletin thus far printed since its first appearance in 1896.

ROUTINE WORK.

The routine work of the office has increased very largely during the year. The number of letters received was 6,540, and the number written about 4,000. This is an increase of more than 50 per cent over the number received (4,253) and mailed (2,041) in 1900. The miscellaneous office work includes examination and filing of reports, sched-

ules, and notes received from correspondents; distribution of several hundred schedules twice each year to migration observers; arrangement of reports and notes received from field naturalists; examination and recording of accounts; care of collections; examination and packing of specimens sent in for identification; forwarding supplies to field naturalists; bibliographical work; and preparation of reports for publication. During the past few months the valuable and rapidly growing collection of photographs taken by members of the various field parties has been rearranged and rendered much more accessible for reference, so that any print and its corresponding negative can be examined at a moment's notice. An important part of the work consists of issuing permits for the entry of foreign birds and animals, investigating complaints regarding violations of the Lacey Act, and answering inquiries concerning local game laws. This work is exacting, requires prompt and unremitting attention, and is constantly increasing. In the last annual report attention was called to the necessity for making some provision for handling the increased correspondence, but as yet no addition has been made to the clerical force, and the energy and ingenuity of the present force are frequently taxed to the utmost to meet the current demands promptly. The recommendation is therefore made that two additional assistants (one a stenographer) be provided for in the next appropriations.

OUTLINE OF WORK FOR THE YEAR 1902.

FIELD WORK.

The plans for field work for the current year, at least so far as this summer is concerned, have already been outlined in reviewing the work for the past fiscal year. They comprise a continuation of the biological survey in California in the High Sierra immediately about the Yosemite Valley and in the region farther south on the Kaweah and Kings rivers. In Texas, field work will be continued in the extreme western end of the State, and an effort will be made to prepare for publication the results of investigations conducted during the past two or three years. The work thus far outlined for Canada contemplates merely a completion of operations along the route from Edmonton, Alberta, to Great Slave Lake.

STUDIES OF THE FOOD OF BIRDS.

The large amount of material collected by Professor Beal in the course of his investigations in the fruit-growing sections of California will be examined in the laboratory, and a report on the results of this examination will be prepared for publication. This report should be of much value in aiding to fix the status of the birds that are charged with damaging California orchards.

A plan is also in contemplation for undertaking an investigation of the food habits of certain game birds as soon as sufficient material can be brought together. The results will doubtless be of value not only to the farmer, but more especially to persons who are interested in game preserves and in restocking covers or improving breeding grounds for the purpose of increasing the local abundance of game.

ENFORCEMENT OF THE LACEY ACT.

The inspection service necessary to prevent importation of noxious birds or animals will be strengthened and improved so far as means

at the command of the Division will permit, and will be extended in the near future to Hawaii. While, as a rule, every effort will be made to facilitate the prompt entry of foreign birds and animals, inspection at the principal ports will be increased, and no effort will be spared to prevent the introduction of species which are likely to prove injurious. In this service lies the chief protection against the introduction of the mongoose and of pests like the English sparrow. The losses which would occur if certain foreign species should once gain a foothold in this country would be enormous in comparison with the small expense necessary to maintain the service on an efficient basis.

The demand for information on game will be met, so far as possible, by the publication of reports on various topics connected with game preservation. A compilation of existing game laws, including the changes made during the present year, will be prepared, accompanied by tables showing in detail the close seasons for the various kinds of game, not only under State laws, but also by counties in the case of certain States which have many local regulations. Besides the investigation of the food of game birds, mentioned above, reports on shipment of game for propagation, on game preserves, and on introduced pheasants, are in contemplation. Much interest has been shown in the introduction of game birds into new localities, or into regions where they have become rare, and many applications have been received for quail and pheasants. The Department has also received offers of birds for introduction, and has been tendered the use of land for making experiments of this kind, but the distribution of game birds, or the acceptance of birds for experiment, has been prevented by lack of a specific appropriation necessary for transportation and maintenance. In view of the activity on the part of game associations and individuals in introducing quail and pheasants, it is an open question whether the introduction of these birds should not be left entirely to private enterprise, and the efforts of the Department devoted to other equally important species that have received comparatively little attention. Several valuable game birds of limited distribution, such as the California mountain quail (*Oreortyx pictus plumiferus*), the Arizona wild turkey (*Meleagris gallopavo merriami*), and the sharp-tailed grouse (*Pediœcetes phasianellus campestris*) would thrive in other regions, and are worthy of the attention of persons interested in introducing new species of game birds. While the Department can not at present make any experiments of this kind, it may be able to advise as to the introduction of these species, and to aid persons interested in such experiments in obtaining birds for propagation.

MIGRATION OF BIRDS.

Ever since its organization, the Division has been collecting data on the migration of birds, and Bulletin No. 2, published in 1888, under the title, "Bird migration in the Mississippi Valley," was based on observations made during the years 1884 and 1885. Since then schedules have been distributed regularly, and notes have been brought together, but until the present year no effort was made to prepare the accumulated data for publication. An arrangement has now been entered into with Prof. W. W. Cooke, the author of the bulletin mentioned, to devote a few months of the summer of 1901 to the elaboration of some of the notes on migration. As the time available for this work is limited, Professor Cooke has selected about sixty of the more important migratory land birds that breed in the United States

but pass the winter in the Tropics, and has undertaken to work out the winter distribution of these species, and ascertain, so far as data will permit, the routes they traverse in passing to and from their breeding grounds. This investigation promises to bring to light many facts of interest to the student of bird migration, and it is unfortunate that present appropriations will not permit a more complete elaboration of the data on hand.

In this connection it should be stated that much valuable material in the form of notes and original observations on birds and mammals has been brought together by the Division, but still remains unpublished. Provision should be made for publishing some of this material, which has been collected at considerable expense, so that it may be made generally available.

DESTRUCTION OF PRAIRIE DOGS.

During the year complaints concerning the depredations of prairie dogs have been received from about 325 correspondents in the plains region of the West. These complaints came from nearly 300 localities, distributed chiefly in the States of Colorado, Kansas, Montana, Nebraska, South Dakota, Texas, and the Territory of Oklahoma, and indicate that in many sections of these States the destruction of prairie dogs is one of the most serious questions confronting the farmer or cattle owner. In the last annual report attention was called to the necessity for a thorough investigation of the subject, and the need of making provision for carrying on the work; but the necessary appropriation was not made by Congress, and the Division is therefore unable, at present, to undertake a comprehensive study of the question.

Owing to the numerous complaints received, however, and the urgency of the demands for information on this subject, a preliminary investigation will be made in the States of North and South Dakota, Kansas, and Nebraska, and some work will also be done in Texas. The data thus far secured by the Division will be utilized in the preparation of a report to be published at an early date. The main problem is to ascertain the poison which may be used most effectively for this purpose, and the minimum cost at which prairie dogs may be destroyed under various conditions. It is well known that bisulphide of carbon will destroy the animals, but the high price at which it is sold in many places in the West prevents its use and gives rise to a general demand for a cheaper and equally effective poison. One great difficulty encountered in using poison is that prairie dogs feed mainly on herbage, and refuse ripe grain when grass or similar food can be obtained. The problem, therefore, resolves itself practically into three phases: (1) Obtaining bisulphide of carbon at lower rates; (2) discovery of some bait which will render the use of strychnine, cyanide of potassium, and similar poisons effective at any season; or (3) the discovery of some substance or combination of substances which will be cheaper than bisulphide of carbon or strychnine, and at the same time equally effective. On the solution of this problem depends the success or failure of many residents in the West who are attempting to cultivate lands in regions infested with prairie dogs.

Prairie dogs occur from Texas to Montana and from Kansas to Arizona, so that nearly a dozen States are interested in the destruction of the pest. This fact alone shows the importance of providing means for a thorough investigation of the whole question of prairie-dog destruction.

RECOMMENDATIONS.

The estimates for the fiscal year 1902 included an increase of $10,000, to provide for the additional work assigned to the Division. The increase actually appropriated was, however, but $2,500, of which sum $1,000 was made immediately available and was almost all expended before the close of the fiscal year. The increase available for the year 1902 was therefore practically reduced to $1,500, an amount which is inadequate to enable the Division to meet the many demands made upon it.

In submitting estimates for the fiscal year 1903 the following recommendations are therefore made: (1) An increase in the salary roll, to provide for two additional assistants, one a stenographer; (2) an increase of $10,000 in the fund for biological investigations, to enable the Division to enlarge the scope of its field work, to place the inspection service required by the Lacey Act on a permanent basis, to investigate more fully the various methods of destroying prairie dogs, to elaborate and prepare for publication material already received, and to collect data and publish reports on birds and on game protection in sufficiently large editions to meet the general demand.

REPORT OF THE CHIEF OF THE SECTION OF FOREIGN MARKETS.

U. S. DEPARTMENT OF AGRICULTURE,
SECTION OF FOREIGN MARKETS,
Washington, D. C., September 1, 1901.

SIR: I have the honor to submit herewith the report of the Section of Foreign Markets for the fiscal year ended June 30, 1901.

Respectfully,

FRANK H. HITCHCOCK,
Chief.

Hon. JAMES WILSON, *Secretary.*

WORK OF THE YEAR.

As the publications of the Section of Foreign Markets grow in number and receive a wider circulation, bringing the object of this office more generally to the attention of the public, the inquiries received regarding our agricultural export trade continue to increase. The large correspondence now required to meet the demands for information that come through the mail forms an important part of the work of the Section.

INQUIRIES REGARDING TRADE WITH THE ORIENT.

Many of the inquiries received during the past fiscal year, like those of the year before, had reference to the Orient, the possibilities of commercial extension in that direction apparently being uppermost in the minds of those looking for foreign-trade opportunities.

COMPUTING MACHINES.

The work of preparing statistics in response to inquiries and for use in publications was greatly facilitated, as in prior years, by the utilization of the modern computing machines with which the office is now provided. Without the assistance of these machines a much larger clerical force would have been required to perform the necessary computations. The machines have proved to be an exceedingly important factor in the operations of the office.

NEW QUARTERS.

The removal of the Section during the latter part of the year to the more commodious quarters now occupied has been of great advantage. As previously quartered, the office was seriously hampered by lack of space and had to perform its duties under trying conditions. The rooms now occupied permit a more convenient distribution of the

work and make it possible to accomplish better results with an equal clerical force.

FOREIGN MAILING LIST.

Considerable time was devoted during the year to the proper classification of the foreign mailing list of the Section. It is highly important for this office to make a judicious distribution of its publications abroad in order that it may the more readily procure in exchange the numerous foreign publications required to obtain adequate statistics of the world's commerce.

PUBLICATIONS.

During the fiscal year 1900 the Section published seven bulletins and a circular, comprising in all 753 pages of printed matter.

REPORT ON OUR AGRICULTURAL EXPORT TRADE, BY COUNTRIES.

The first publication of the year was a report reviewing our agricultural export trade with the several foreign countries during 1895–1899. In this report, which was issued as Bulletin No. 20, the official statistics of exportation were so compiled and classified as to show in separate statements for each country of destination the nature and value of the various products of American agriculture there marketed.

REPORT ON OUR AGRICULTURAL IMPORT TRADE, BY COUNTRIES.

Following the publication just mentioned, a similar report, published as Bulletin No. 21, was issued on the subject of our agricultural imports. The special object sought in the preparation of Bulletins Nos. 20 and 21 was to secure a statistical arrangement making it possible to determine at a glance the extent and character of our agricultural exports to or imports from any given country. Besides affording a convenient medium for answering inquiries, these two reports proved to be exceedingly useful for reference in the general work of the office.

REPORT ON THE TRADE OF DENMARK.

Several years ago a report was planned regarding the foreign trade of Denmark, that country being of special interest agriculturally because of the success there attained in the development of an export trade in products of the farm. The completion of the report at that time was prevented, however, owing to the more urgent statistical work called for by the breaking out of the Spanish-American war. During the past year the material previously gathered on the subject of Danish trade was thoroughly revised, and after being supplemented by much additional matter, bringing the facts as nearly to date as the Danish statistics available would permit, was issued as Bulletin No. 9, taking the number the report would have received if published as originally planned.

REPORT ON OUR TRADE WITH SCANDINAVIA.

During the preparation of the report on the trade of Denmark some elaborate statistical tables were compiled regarding the commerce carried on between the United States and the three Scandinavian coun-

tries—Denmark, Sweden, and Norway—the intention being to append these tables as a part of that bulletin. It was found, however, that their inclusion would make the report too large for convenience, and they were accordingly made the subject-matter of a separate publication entitled "Our trade with Scandinavia," and issued as Bulletin No. 22. This report gave a detailed statistical review of our trade with Scandinavia from 1890 to 1900, inclusive, supplementing with our own official statistics of importation and exportation the less detailed Scandinavian records published in the prior bulletins, Nos. 7, 8, and 9, relating to Norway, Sweden, and Denmark, respectively.

The value of the several reports regarding Scandinavian commerce was considerably enhanced by the fact that little had previously been printed in the English language on this subject. By the statistics presented it was shown that these countries of northern Europe, and especially Denmark, furnished interesting examples of aggressive foreign-trade development. Their commerce with the United States increased in value from $12,000,000 in 1890 to $34,000,000 in 1900, a gain of nearly 200 per cent for ten years.

Notwithstanding the fact that agriculture is a prominent industry in Scandinavia, the United States marketed there during 1900 over $20,000,000 worth of farm products, these products forming in value about 70 per cent of our total domestic exports to that destination. Indian corn, oil cake and oil-cake meal, cotton, oleo oil, lard, and wheat and wheat flour were the principal items.

REPORT SUMMARIZING OUR FOREIGN TRADE IN AGRICULTURAL PRODUCTS.

The usual summary report reviewing the annual import and export trade of the United States in agricultural products, without detail as to sources and destinations, was published as Bulletin No. 23. This report analyzed the leading features of the returns for 1900 and compared the statistics for that year with the figures for 1899 and preceding years of the decade.

With the single exception of 1898 the fiscal year 1900 witnessed the largest exports of farm produce from the United States up to that time recorded. The aggregate value of these exports was $845,000,000, or within $15,000,000 of the exceptionally high figures for 1898. Compared with 1899 the returns for 1900 showed a gain of more than $50,000,000. This remarkable increase over 1899 was explained in part, however, by the higher price of cotton, the exports of which, although actually smaller than in 1899, advanced nearly $33,000,000 in total value.

Next to cotton, the largest gains in value occurred in the exports of meat products and live stock. Among the numerous other examples of increase, tobacco, fruits and nuts, vegetable oils, oil cake and oil-cake meal, seeds, and dairy products were the most conspicuous.

Our agricultural imports for the fiscal year 1900 had an aggregate value of $420,000,000, forming nearly 50 per cent of the entire import trade. This record showed an increase of nearly $65,000,000 over the figures of the year before, hides, silk, and wool being the leading factors in this growth. Considerable gains were also made in the importation of vegetable fibers, sugar, and tobacco.

REPORT ON THE SOURCES OF OUR AGRICULTURAL IMPORTS.

Two years ago a report was published on the sources of the agricultural imports of the United States, showing for 1894–1898 the annual

quantity and value of the various agricultural products received from the several countries of supply. During the past year this report was supplemented by a similar publication bringing the statistics of importation by countries down to date. This latter report covered the five-year period 1896–1900, and was issued as Bulletin No. 24.

While it required much time and labor to prepare a report of this character, the task seemed fully justified in view of the great usefulness of the earlier bulletin, which for two years was extensively utilized as a means of answering inquiries relative to the import trade, and also as a basis for statistical statements on that subject.

REPORT ON THE DISTRIBUTION OF OUR AGRICULTURAL EXPORTS.

The report of two years ago on the sources of our agricultural imports was prepared and issued in conjunction with a similar publication relating to the distribution of our agricultural exports. This report on exportation was also supplemented during the year by a later issue, published as Bulletin No. 25, bringing the subject-matter down to date in the same manner as that described for Bulletin No. 24. Like Bulletin No. 24, the report on the distribution of our exports covered the five-year period 1896–1900, showing in the greatest possible detail the annual quantity and value of the various products of American agriculture marketed in the several countries of destination.

The statistics published in Bulletin No. 25 disclosed some interesting examples of growth in our agricultural export trade during the five years. Perhaps the most striking of these examples was afforded by our shipments to Asia and Oceania. The value of the American farm produce marketed in Asiatic countries rose from $5,735,000 in 1896 to nearly $23,000,000 in 1900, the latter record far exceeding that for any previous year. In our agricultural export trade with Oceania there was an advance in value during the same period from $3,986,000 to $6,799,000. The figures for 1900, as in the case of Asia, were decidedly the highest ever recorded.

Of the Asiatic countries to which our exports increased, Japan was the most conspicuous. In 1900 we shipped to that country products of agriculture worth over $15,000,000, while in 1896 the value of our consignments barely exceeded $2,000,000. Each year subsequent to 1896 witnessed a decided gain.

Among the countries of Europe with which trade growth was recorded, Denmark furnished a notable example. Our agricultural exports to that country in 1896 were valued at only about $5,000,000, whereas in 1900 their value rose to nearly $15,000,000.

Another striking instance of growth occurred in our trade with British Africa, the value of the American farm produce sent to that destination increasing from $5,300,000 in 1896 to $10,300,000 in 1900.

One of the most interesting features of the trade during 1896–1900 was the rapid development of our agricultural exports to the new island dependencies. The value of domestic farm produce sent to Cuba, Porto Rico, Hawaii, and the Philippine Islands in 1900 exceeded $20,000,000, as compared with only $6,269,000 in 1896. These exports exhibited a gain during the five years of over 200 per cent.

The growth in our agricultural exports to Cuba was particularly marked. In 1896 our shipments to that island were at low ebb, having a value of less than $4,000,000, but since then there have been important gains each year, culminating in 1900 with a value of $14,000,000.

CIRCULAR ON AGRICULTURAL IMPORTS AND EXPORTS.

In order to permit a more general distribution of the leading facts printed in Bulletin No. 23, some statistics prepared for that report were afterwards published in a small pamphlet issued as Circular No. 23.

TESTIMONY BEFORE THE INDUSTRIAL COMMISSION.

At the invitation of the United States Industrial Commission, the chief of the Section appeared before that body as a witness on the subject of our agricultural export trade. His testimony dealt largely with trade methods and conditions, pointing out in particular certain obstacles that confront our exporters of farm produce, and offering some suggestions with regard to possible remedies. As these matters had not been so fully covered in the publications of the Section, it was recommended by the Editor of the Department that the testimony be reprinted and issued as a departmental report. This plan was carried out during the past year, the testimony in question being published as Report No. 67 of the Department, under the title "Foreign markets for American agricultural products."

AGRICULTURAL EXPORTS DURING 1901.

From statistics recently compiled by the Section, it appears that the past fiscal year was marked by the largest agricultural export trade in our history, the value of the domestic farm produce marketed abroad during the twelve months ended June 30, 1901, exceeding the enormous sum of $950,000,000. The largest previous value was that for the fiscal year 1898, amounting to $859,000,000. Next to these figures the highest record occurred in 1900, when farm products worth $845,000,000 were sent abroad. Compared with the exports for 1900, the increase during 1901 was quite extraordinary, amounting to $105,000,000.

The products that contributed most to the remarkable gain of the past fiscal year were cotton, wheat, cattle, lard, hams, cotton-seed oil, and fresh beef. Our exports of cotton for 1901 had a value of $315,000,000, showing an increase of $72,000,000 over the figures for 1900. In the wheat exports there was a gain of $24,000,000, the value for 1901 advancing to $97,000,000. The exports of cattle rose to $38,000,000, showing an increase of $7,000,000 for 1901. In the case of lard there was an advance of $5,000,000, the record for 1901 being $47,000,000. The exports of hams, of cotton-seed oil, and of fresh beef showed in each instance a gain of over $2,000,000, the value of the hams sent abroad advancing to nearly $23,000,000, that of the fresh beef to $32,000,000, and that of the cotton-seed oil to $17,000,000.

Other items in our agricultural export trade, the value of which increased more than $1,000,000 during 1901, were oil cake and oil-cake meal, wheat flour, salted or pickled pork, oleo oil, horses, and sheep.

TRADE WITH INSULAR DEPENDENCIES.

Some statistics have also been compiled by the Section relative to the trade in agricultural products carried on during the past fiscal year between the United States and the new insular dependencies, with the exception of the Hawaiian Islands. Unfortunately, no official returns are now made of the exports from the United States proper

to the last-mentioned islands, the Hawaiian group being treated in our foreign-commerce returns as an integral part of the country.

The statistics of our exports to Cuba, Porto Rico, and the Philippine Islands show that during 1901 we sent to these three destinations $18,600,000 worth of farm produce, the shipments comprising in value about 53 per cent of all the domestic merchandise marketed in these various islands. As compared with our agricultural exports to Cuba, Porto Rico, and the Philippines, in 1900, valued at $17,551,000, the record for 1901 discloses a slight increase. The gains occurred in the trade with Porto Rico and the Philippines, the value of our agricultural exports to the former island advancing during the two years from $2,311,000 to $3,500,000, while in the case of the Philippines there was an increase from $1,657,000 to $2,500,000. Our agricultural exports to Cuba, on the other hand, exhibited a slight falling off in 1901, the record for that year being $12,600,000, as against $13,583,000 for 1900.

As regards our import trade with Cuba, Porto Rico, and the Philippines, the records for 1901 show a large increase in the amount of agricultural produce received from those sources, the value for that year amounting to $48,600,000, while in 1900 it was only $36,162,000. The chief part of this increase took place in our imports from Cuba, which advanced from $27,226,000 in 1900 to $38,700,000 in 1901. There was also a considerable gain in our importations from Porto Rico, the value for 1901 being $5,500,000, as compared with only $2,991,000 for 1900. In the case of the Philippines a noticeable decline occurred, the value falling from $5,945,000 in 1900 to $4,400,000 in 1901.

OUR COMMERCE ON THE PACIFIC.

In the month of June the chief of the Section of Foreign Markets was detailed to accompany the Committee on Rivers and Harbors of the United States House of Representatives upon its tour of inspection to the ports and waterways of the Pacific coast. This trip afforded a favorable opportunity for the collection of certain information relative to the agricultural export trade of the various ports visited. The facts gathered will be utilized to advantage in the future work of the office.

AGRICULTURAL EXPORT TRADE OF THE PACIFIC PORTS.

During the fiscal year 1900 over $70,000,000 worth of domestic merchandise was sent abroad through our Pacific ports. Of this merchandise, about $45,000,000 worth, or considerably more than half, consisted of farm produce.

Among the agricultural exports from the Pacific coast in 1900, breadstuffs formed decidedly the most important item, the shipments under this head amounting in aggregate value to about $28,000,000. Wheat and wheat flour comprised a large part of the item, the exports of wheat in the grain being valued at $13,800,000, and the exports of wheat flour at $8,700,000. Next to wheat, the principal grain exported was barley, of which there were shipments worth $4,300,000. Oats were exported to the value of $208,000. Bran, middlings, and mill feed formed an item of $225,000, and bread and biscuit one of $176,000.

After breadstuffs the principal agricultural export from the Pacific coast in 1900 was cotton, the shipments of which had a value of nearly $8,000,000.

Fruits also occupied an important place in the Pacific export trade, the consignments for 1900 amounting in value to over $3,000,000. Canned fruits formed the principal part of these exports, having a value of about $2,400,000, while the shipments of fresh and dried fruits were valued at a little more than $600,000.

Another leading item was that comprising the various meat products, the exports of which had an aggregate value of $1,086,000. Canned beef, hams, lard, and bacon were the principal articles. The value of the canned beef exported was $205,000, that of the hams $199,000, that of the lard $143,000, and that of the bacon $111,000.

Live animals, and especially mules and horses, were also shipped quite extensively. Mules formed an item of $427,000 and horses one of $347,000. The exports of animals of all kinds amounted in total value to about $950,000.

There was a considerable exportation of malt liquors through our Pacific ports in 1900, consignments worth $662,000 being reported.

Dairy products were exported to the value of about $600,000. Milk formed an item of $311,000 and butter one of $212,000. The exports of cheese were comparatively small.

Ginseng was an item of considerable importance, the shipments of this product having a value of $426,000.

Vegetables comprised an item of $414,000. Potatoes, valued at $123,000, were the principal exports in this class.

There was also an important export trade in wines, the shipments of the year amounting in value to $412,000.

Other agricultural exports from the Pacific coast in 1900 with a value exceeding $100,000 were as follows: Hay, $376,000; distilled spirits, $366,000; leaf tobacco, $336,000; rice, $296,000; and refined sugar, $139,000.

PLANS FOR THE CURRENT FISCAL YEAR.

In addition to the three trade reports that are now issued annually by the Section, corresponding to Bulletins Nos. 23, 24, and 25 of the past fiscal year, and later issues of which are in course of preparation, several publications have been planned with the object of making more readily available the official import statistics, so far as they relate to farm produce, of the principal foreign countries. A report on the agricultural imports of the United Kingdom has already been begun, to be followed by similar publications in reference to other nations. The special object of these reports will be to show what proportion of the various products of agriculture, needed by these countries to meet their domestic requirements, is being furnished by the United States and by other producing countries. It is believed that statistics of this character will be exceedingly useful in pointing out the directions in which our agricultural export trade shows the greatest opportunities for development.

The preparation of the exhaustive report on Chinese commerce, for which considerable matter has already been compiled, will be continued, and it is hoped that before the end of the current fiscal year its publication will be possible.

REPORT OF THE LIBRARIAN.

U. S. DEPARTMENT OF AGRICULTURE,
OFFICE OF THE LIBRARIAN,
Washington, D. C., August 29, 1901.

SIR: I have the honor to submit herewith the executive report of the Library for the fiscal year ended June 30, 1901.

Respectfully,

JOSEPHINE A. CLARK,
Librarian.

Hon. JAMES WILSON, *Secretary.*

WORK OF THE YEAR.

ACCESSIONS TO THE LIBRARY.

During the past year the accessions to the Library have numbered over 4,000 books and pamphlets. These accessions have included many reference books of especial value in the work of the Department and a large number of scientific periodicals. The following are among the most noteworthy acquisitions to the Library during the year: Martius's Historia naturalis Palmarum, 3 folio volumes, fully illustrated; the latest edition of Beilstein's Handbuch der organischen Chemie, a standard work in chemistry; Doubleday and Westwood's Genera of Diurnal Lepidoptera, 2 volumes, and Leech's Butterflies from China, Japan, and Korea, 3 volumes, both of which works are richly illustrated by colored plates. Archiv für Zoologie und Zootomie, 1800–1805, Der Naturforscher, 27 volumes, 1774–1793, and Belgique horticole, 35 volumes, completing the Library copy, are among the valuable additions to the periodicals. At the sale of the library of the noted naturalist Henri Milne-Edwards, in Paris, over sixty works on zoology were obtained, many of which are rarely available for purchase. To the class of books on gardening such publications as Gardens Old and New, Cook's The Century Book of Gardening, and Henderson's Picturesque Gardens have been added.

PERIODICALS.

The periodicals and serial publications currently received by purchase and by exchange number considerably over 2,000. These publications include farm papers, technical scientific journals, and serial publications of learned societies from all parts of the world. The widespread distribution of the Department publications on condition of exchange has materially enlarged the collections of foreign serials during the past few years. This class of accessions to the Library is the largest and it is the most valuable in the current work of the Department.

CATALOGUE.

The cataloguing of the Library has progressed more rapidly than before on account of the increased number of cataloguers. The "Catalogue of periodicals and other serial publications in the Library of the U. S. Department of Agriculture," which has been completed the past year, is the most important work in special cataloguing which has been done. This catalogue comprises entries for over 4,000 periodicals and serials, and is the beginning of a printed subject catalogue, which will appear in parts in a series of Library bulletins.

In addition to the regular work on the catalogue two reference lists on special subjects have been in progress; one list comprises references to publications on irrigation and land drainage, and the other, references to publications on tobacco, both of which will soon be completed and appear as Library bulletins.

REFERENCE WORK.

The enrollment of scientific aids and student assistants in the Department to pursue special lines of work and study has largely increased the amount of reference work in the Library; also certain collections in the Library which are more nearly complete than are to be found elsewhere in the country have afforded assistance to scientists at a distance, who have been engaged in special investigations and monographic work.

Many teachers and pupils of the public schools in Washington have availed themselves of the privilege of consulting works in the Library, especially those on natural history.

PUBLICATIONS.

The quarterly bulletins of accessions to the Library have been regularly issued, comprising about 100 printed pages. The "Card index to the Department publications" has been continued, but, on account of the limited funds for printing, the issues have been few in number, a fact to be regretted, inasmuch as this publication has proved to be a valuable key to the Department publications and has led to more careful arrangement and preservation of these documents for public use.

BINDING.

The preparation of books for binding has been kept up to meet the current needs. The number of books bound, 814, included chiefly periodicals, since it has been necessary to make a selection from the large number of volumes awaiting binding. A lack of available funds has prevented the necessary binding of a great number of works, notwithstanding the fact that the preservation of many of these is endangered by delay in binding.

RELATION OF THE LIBRARY TO AGRICULTURAL COLLEGES AND EXPERIMENT STATIONS.

There are several ways in which the Department Library could be more closely related to the agricultural colleges and experiment stations than heretofore. This collection of books and pamphlets on agriculture and allied subjects being the largest in the country, and

containing many works too expensive for each agricultural college to buy, could be made more often available to special workers in these colleges. This class of workers should be the next to be benefited by the use of the Library after the employees of the Department, whenever it can be done without interference with the work of the Department. It would extend the usefulness of the Library, and it would be appreciated by those aided in their researches. Again, the duplicate copies of many publications which accumulate from year to year in all large libraries could be exchanged between this Library and the libraries of agricultural colleges and experiment stations to the advantage of both. A list of available exchanges will be issued by this Library at an early date for the purpose of furthering such exchanges. The request has come from agricultural colleges for suggestions concerning better methods in the administration of their libraries, and, if possible, for assistance in carrying them out. It would seem to be a legitimate function of the Library to have in training scientific aids who should be preparing to meet these requests. In addition to previous library training, such aids could become familiar with agricultural literature and gain experience that would enable them to organize an agricultural library and to continue its administration. Scientific aids, with the necessary qualifications, would also advance the work of the Library.

RECOMMENDATIONS.

The facility with which scientific investigations can be carried on in the Department depends very largely upon the completeness of the collection of books in the Library and its preservation and accessibility for ready use. In order to fulfill these requirements, and thereby meet the needs of the constantly increasing number of users of the Library in connection with the broadening fields of investigation, a larger appropriation should be made for the purchase of scientific books and periodicals; also a special appropriation is needed for binding current periodicals in the Library. An appropriation for scientific aids and such other assistants as shall advance the preparation of reference lists in connection with current work of the Department is a present need.

A most urgent matter for consideration is the provision for safer and more commodious rooms for the preservation and administration of the Library. This collection of 70,000 and more books and pamphlets is of exceptional value, and could not be duplicated for many years, if at all, and without a much larger expenditure of money than it has already cost. The delay to investigations from loss of any considerable part of the collection can not be estimated. In addition to the unsafe housing of the books, the accommodations for readers and for the work of the Library staff are crowded and inadequate. This crowded condition arises largely from the generally crowded condition of the Department, which necessitates the occupying of room in the Library for other than library purposes. I would, therefore, earnestly recommend that early consideration be given to these needs as set forth above, that the growth of the Library may be furthered, and thereby meet the demands of the expanding work of the Department.

REPORT OF THE DIRECTOR OF THE OFFICE OF EXPERIMENT STATIONS.

U. S. DEPARTMENT OF AGRICULTURE,
OFFICE OF EXPERIMENT STATIONS,
Washington, D. C., September 14, 1901.

SIR: I have the honor to present herewith the report of the Office of Experiment Stations for the fiscal year ended June 30, 1901.

Respectfully,

A. C. TRUE,
Director.

Hon. JAMES WILSON, *Secretary.*

WORK OF THE YEAR, WITH RECOMMENDATIONS.

DIVISION AND DEVELOPMENT OF WORK OF OFFICE OF EXPERIMENT STATIONS.

During the past year the work of the Office of Experiment Stations has continued to increase by the addition of new enterprises and the further development of those previously undertaken. Agricultural experiment stations, under the direct management of this Office, have been established in Hawaii and Porto Rico. Both the nutrition and irrigation investigations have been conducted on a larger scale than in previous years. The amount of material prepared for publication during the year has exceeded that for any similar period since the establishment of the Office. Unusual opportunities have been afforded for the study of the more general problems relating to the organization and development of agricultural education and research, and there is good reason for believing that along the lines already laid the Office may be able in the future to enlarge its usefulness in promoting these important interests. Besides closing up the work connected with the collective experiment station exhibit made at Paris, this Office has performed considerable labor in the remodeling of this exhibit and its installation at the Pan-American Exposition at Buffalo. With other expositions already in sight, it now seems likely that exhibit work may become a regular function of the Office, for which provision will have to be made in planning its operations from year to year.

To meet its new responsibilities, the organization of the Office has been extended in accordance with the plan previously adopted. The present division and assignment of the work of the Office are as follows: (1) Relations with American and foreign institutions for agricultural education and research, including the supervision of the expenditures of the agricultural experiment stations in the United States, in immediate charge of the Director; (2) the Experiment Station Record, in charge of the assistant director, Dr. E. W. Allen;

(3) Experiment Station Work and miscellaneous publications of the Office, in charge of Mr. W. H. Beal; (4) division of routine business, in charge of Mrs. C. E. Johnston; (5) Alaska Agricultural Experiment Station, in charge of Prof. C. C. Georgeson, with headquarters at Sitka; (6) Hawaii Agricultural Experiment Station, in charge of Mr. Jared G. Smith, with headquarters at Honolulu; (7) Porto Rico Agricultural Experiment Station, in charge of Mr. Frank D. Gardner, with headquarters at San Juan; (8) nutrition investigations, in charge of Prof. W. O. Atwater, with headquarters at Middletown, Conn.; (9) irrigation investigations, in charge of Prof. Elwood Mead. As hitherto, certain officers connected with the force at Washington, D. C., have been charged with promoting the interests of our more important outside enterprises as a regular part of their official business. Thus, Dr. C. F. Langworthy is our local representative for the nutrition investigations, and Dr. Walter H. Evans for the experiment stations in Alaska, Porto Rico, and Hawaii. With the development of the irrigation investigations it has been found necessary and desirable to transfer the headquarters of Professor Mead, the expert in charge, to Washington, D. C., leaving Mr. C. T. Johnston in charge of the station for the supervision of field work maintained at Cheyenne, Wyo.

As far as practicable the organization of the Office has been put on the same footing as that of other branches of the Department having complex functions. In this way the development of its organization has been made to conform to the prevalent movement within the Department, which has recently led to its partial reorganization under a bureau system. As it seems clear that this Office has become and is likely to remain one of the main divisions of the Department, it is only just that this fact should be formally recognized either by making it a bureau or by recognizing it as of equal rank with a bureau without changing its name.

As regards the future development of the Office, it seems to me desirable that its functions should be restricted for the most part to those of a kind of clearing house for the institutions for agricultural education and research at home and abroad, and to the management of the agricultural experiment stations directly maintained by the Federal Government. Its chief business should be (1) to study the general problems involved in the organization and management of various kinds of institutions for the discovery of new knowledge which may be applied to the benefit of agriculture and for the diffusion of such knowledge among our agricultural people, and (2) to collate for publication the results of the work of agricultural institutions at home and abroad. To this would naturally be added such administrative duties as Congress may devolve upon this Department relating to the supervision of national funds appropriated for the maintenance of agricultural experiment stations or to the direct management of such stations under Federal authority. In the past it has been deemed expedient to give this Office general supervision of certain special investigations which were to be carried on largely in connection with colleges and experiment stations. While administrative reasons may justify this procedure in some cases, it is not in my judgment desirable that this practice should be followed to an extent which would make the Office permanently responsible for the conduct of a considerable variety of such investigations. In view of the fact that questions relating to the reorganization of this Department are now being discussed, I desire to raise the question whether the time

has not already come for separating from this Office the important enterprise which has been organized within it as the irrigation investigations. These investigations are now well established and seem likely to be a permanent part of the business of this Department. In my judgment they form a sufficient basis on which to create a new bureau, corresponding to one of the great general divisions of agricultural science, namely, rural engineering. There are many problems connected with the laying out of farms and other rural estates, as well as parks, which this Department would do well to consider. Among these are questions relating to systems of drainage, water supply and sewage, terracing and other methods for preventing washing of land, landscaping, etc. Moreover, problems relating to farm buildings, implements, and machinery should be studied by the Department. In this country relatively little attention has thus far been given to agricultural engineering and many of its branches have hitherto been almost entirely neglected by this Department. I can not, however, see any good reason for further delay in taking up these important matters, and believe that an efficient Bureau of Rural Engineering would accomplish results of great usefulness.

By continuation of his detail to the Division of Botany, Dr. E. V. Wilcox completed his part of the investigation on the effects of poisonous plants on sheep feeding on the ranges of Montana and prepared a report thereon which has been published in Bulletin No. 26 of that Division. He also prepared an article on the same subject for the report of the Bureau of Animal Industry for 1900. During the present summer he has been detailed to the Bureau of Forestry to aid in conducting an investigation on the effects of grazing sheep in the forests of Wyoming. Mr. D. W. May was detailed for some time to the Division of Vegetable Physiology and Pathology, where, in connection with Dr. Loew, he made an investigation on the physiological relations of lime to magnesia in plant production, an account of which will appear in a forthcoming bulletin of that Division. Under advice of his physician, Mr. V. A. Clark felt compelled to change his residence from Washington, and after a short period of service in our irrigation office at Cheyenne, Wyo., he left our service, to our great regret. The irrigation investigations suffered a severe loss in the death of Col. E. S. Nettleton, whose service as an irrigation engineer in public and private capacities for many years had been an important factor in the establishment of the great irrigation system of the West.

The establishment of the experiment stations in Alaska, Porto Rico, and Hawaii, the broader and more intimate relations sustained with experiment stations in this country and abroad (now numbering in the aggregate about 800 stations and kindred institutions), and the enlargement of our efforts for the promotion of agricultural education have caused a material increase in the general business of the Office and necessitated the employment of some additional clerical and expert service. There is, moreover, considerable additional work imposed upon the Washington office in connection with the supervision of the stations in Alaska, Porto Rico, and Hawaii. To meet the necessities of this extra work the regular appropriation for the maintenance of this Office should be increased to $35,000. In addition to this, I recommend an appropriation of $5,000 be asked for to enable this Office to undertake the work connected with the promotion of the farmers' institute system in this country, as suggested on page 195 of this report.

Relations with American and Foreign Institutions for Agricultural Education and Research.

The general features of the work of the Office involved in its relations with American and foreign institutions for agricultural education and research, in immediate charge of the Director, have remained essentially as heretofore and may be conveniently described under the following heads: (*a*) Agricultural experiment stations in the United States; (*b*) American institutions for agricultural education; (*c*) Association of American Agricultural Colleges and Experiment Stations; and, (*d*) foreign institutions for agricultural education and research.

AGRICULTURAL EXPERIMENT STATIONS IN THE UNITED STATES.

ADVISORY RELATIONS WITH THE STATIONS.

The functions of this Office in its advisory relations with the stations in the different States and Territories continue to grow in importance and to involve a larger amount and variety of work. The importance attached to the advice and assistance of this Office in many matters relating to the business of the stations is shown not only by an increase in the correspondence on these subjects, but also by more frequent calls for personal conferences between station officers and representatives of this Office. Through the regular annual visitation of the stations, the meetings of the Association of Agricultural Colleges and Experiment Stations, and the increasing number of visits of station officers to this Department the relations between this Office and the stations are becoming more and more intimate. While this makes it necessary to devote a larger amount of time and energy to this branch of our work, it is believed that the importance of the service thus rendered fully justifies all the attention given to it. Indeed, it would undoubtedly be still more profitable if more time could be given to visiting the stations and studying the problems which they respectively have to meet. In particular, recent experience has shown that it would be well if the representatives of this Office could come into closer touch with the governing boards of the stations.

If an arrangement could be made by which a representative of the Office could attend at least one meeting of the board of control in each State and Territory each year, it is believed that much good might result. This could not, however, be accomplished without an arrangement of our business which would involve the devotion of considerably more time than is now taken for the visitation of the stations. This would carry with it some addition to our working force. As it is, the boards of control of a considerable number of our stations are not thoroughly acquainted with the views of this Department regarding the management of the stations, and do not clearly understand the relations of the individual stations to the system of agricultural research in this country. This is a great hindrance to the progress of our stations and at present constitutes one of the most serious difficulties in their management.

With a view to bringing out more clearly the results of experience in the planning and conducting of different lines of station work, this Office proposes to take up from time to time special features of station work and make a report thereon, which will bring out the different methods of operation pursued at different stations. For example, data are now being collected respecting the operations of the stations

in plant production (agronomy), which will show the extent of such operations at the different stations as well as the methods pursued in this line of work. It is hoped that such a comparative view of these subjects will be useful in promoting more careful planning of work, more thorough study of methods, and a better correlation of the work of the different stations. Many of our most efficient station officers are convinced that much more attention should be given to the correlation of station work, with a view to the prevention of duplication and the promotion of a more systematic method of attacking agricultural problems. Without doubt there is here an opportunity for the profitable extension of the operations of this Office, but this can not be done without some increase in its resources.

In some ways the past year has been a notable one in the progress of agricultural research in this country. The results of practical importance already attained have inspired the public with such confidence in the value of this kind of investigation that Congress and the State legislatures have been unusually liberal to this Department and the experiment stations. At the same time business enterprises requiring scientific and expert knowledge and skill for their most successful management have been unusually prosperous. The managers of these enterprises have awakened to a much clearer appreciation of the value of the services of such men as are most successful workers in our institutions in agricultural education and research. An increasing number of our best workers in these institutions have therefore been given very attractive offers from the business world. So many public and private positions for well-trained and experienced workers in agricultural science and research have been opened that in some lines the demand has outrun the supply. This has led to numerous changes in the personnel of our experiment stations, partly through the transfer of their officers to outside enterprises, and partly through the change of officers from one station to another on account of differences in salary and other attractions. This is a remarkable state of things, considering the length of time during which our stations have been in operation, and brings them face to face, in a measure, with the same difficulties which attended their earlier operations when, for different reasons, there was an inadequate supply of trained workers. Without doubt the enterprise of agricultural research in general has been much strengthened by this recent development, but boards of control would do well to remember that frequent changes of officers inevitably weaken a station's operations and that they can not well afford to let thoroughly efficient workers go, especially in cases where small increases in salary or other comparatively trifling inducements would hold them.

As the work of the experiment station makes a more definite impression upon the public mind and is more clearly differentiated from that of the agricultural college as a whole, the State legislatures are called upon to make special appropriations for investigations by the stations. A notable example of this was the action of the recent legislature in Illinois, which appropriated $46,000 for the next two years to be expended as follows: Experiments with corn, $10,000; soil investigations, $10,000; investigations in horticulture, $10,000; experiments in stock feeding, $8,000; dairy experiments, $5,000, and sugar-beet experiments, $3,000. This is in line with the development of the stations as distinct departments of the agricultural colleges. As such, the stations are, without doubt, entitled to definite recognition in the budgets of these institutions. A number of States have

recognized the value of the experiment stations by appropriations for substations. It is still, however, an open question whether appropriations for special investigations which may be conducted in different localities, according to circumstances, would not be more advantageous to agriculture than local substations.

There has recently been good progress in the recognition of the experiment station as a distinct unit within the college by the provision of separate buildings or parts of buildings for the exclusive use of the station. In Nebraska a building costing $35,000 has been erected for the use of the experiment station. At the Louisiana State station a new laboratory building has been devoted exclusively to station purposes. In Pennsylvania a separate building for investigations on animals with the respiration calorimeter has been erected. In Alabama a new analytical laboratory has been provided for the station. In Illinois, Michigan, Mississippi, Oklahoma, Tennessee, Texas, and Kansas separate offices and laboratories for the station have been reserved in buildings erected for the use of the college. In this way material additions have been made, the facilities for station work in a number of States have been improved, and the importance of the station as a distinct department of the college has been greatly enhanced.

During the past year the office of director of the station has been separated from that of president of the college or university in four States—Colorado, Kansas, Nebraska, and North Carolina. In New Mexico and Tennessee, where the president retains the directorship, a vice-director has been appointed to have general charge of station business. In South Dakota the president of the college has recently been made acting director of the station, but it is understood that this is only a temporary arrangement pending the election of a new director. In eleven States and Territories the college president at present performs the functions of director of the experiment station.

In a number of instances newly appointed officers of the experiment stations have no duties as teachers in the college, and in other instances changes have been made by which the amount of teaching required of station officers has been materially reduced. Experience is each year showing more conclusively that if station officers are to accomplish the best results in agricultural investigations their research work must be made their primary business, before which routine duties of every kind must give way as the conditions of the original work demand. Our most successful stations are now managed on the principle that they constitute university departments of the colleges, that they are thus at the summit of our system of agricultural education, and that they must be managed on the same principles as the great scientific laboratories in the universities are conducted, that is, their officers must be the the best-trained experts in their respective lines, and they must be able to devote their time and energy quite fully to their investigations. They should not be expected to do any considerable amount of teaching, especially in the elements of the sciences. If they go into the class room at all, it should be rather to lay before advanced students the methods and results of the investigations which they are conducting. Undoubtedly, the financial exigencies of many of our agricultural colleges will for some time prevent the attainment of this ideal in station management, but we may reasonably expect that wherever increases in the resources of these institutions will permit, changes in this direction will be made in the management of the stations.

SUPERVISION OF EXPENDITURES.

The sixth annual examination of the work and expenditures of the agricultural experiment stations which receive the National funds appropriated under the act of Congress of March 2, 1887 (Hatch Act), with special reference to the fiscal year ended June 30, 1900, was made during the past year in accordance with the authority conferred upon the Secretary of Agriculture by Congress, and a report of this investigation was prepared for transmission to Congress, as required by law. This report was published as House Doc. No. 336 (Fifty-sixth Congress, second session), and a special edition was issued as Bulletin No. 93 of the Office of Experiment Stations and distributed to the governing boards and officers of the stations.

As heretofore, the report was based upon three sources of information, viz, the annual financial statements of the stations, rendered on the schedules prescribed by the Secretary of Agriculture in accordance with the act of Congress; the printed reports and bulletins of the stations, and the reports of personal examinations of the work and expenditures of the stations made during the year by the Director, assistant director, and one other expert officer of the Office of Experiment Stations. The stations in all the States and Territories have been visited since the previous report was transmitted to Congress.

The following statements, taken from the report, indicate the general condition of the stations, especially in relation to the terms of the Hatch Act and the appropriation by Congress under that act:

The work of the stations as related to practical agriculture.—In making our examination of the work of the experiment stations during the past year we have particularly inquired whether their operations are conducted with special reference to the agricultural needs of their respective States and Territories. The results of this inquiry are embodied in the accounts of the individual stations given in this report. From these it will be seen that by far the largest part of the work of our stations has direct relation to the important agricultural interests of the communities in which they are located. The stations are, in fact, very responsive to the immediate demands of their farmer constituencies. Their greatest danger is not that they will undertake too much work of remote practical bearing, but that in the effort to meet the calls made upon them for immediate assistance they will attempt individually to cover more fields of investigation than the funds at their disposal will permit them to treat thoroughly. This temptation the stations generally are, however, resisting more successfully as their work is becoming better organized and their investigations are more carefully planned and supervised. The nature of their operations is also becoming better understood by the farmers, and the desirability of more thorough and far reaching investigations is much more appreciated than formerly. A broader and deeper foundation of scientific inquiry is being laid each year, and there is a constant accumulation of data regarding the general agricultural conditions of the different regions of the United States. The climate, soil, water supply, native and cultivated plants, injurious insects, fungi, and bacteria are being studied in more detail and with greater thoroughness than ever before. The principles of nutrition of animals and the causes of their diseases are being subjected to more elaborate and fundamental scrutiny. Methods of investigation and the improvement of apparatus for research are being given increased attention. Much of this work is done without public observation and in the intervals of other operations. Without doubt it should receive more definite recognition and encouragement. But it is a cause for congratulation that so much patient labor of this character is being performed by station officers, who, as a rule, are seeking to advance the boundaries of knowledge for useful ends and are not deterred by a multiplicity of duties from giving attention to the more fundamental concerns of agricultural science. And this work is having its effect on the more practical operations of our stations. These are assuming a more substantial and systematic character and are being conducted with more definite relation to actual conditions. They have, therefore, a greater assurance of successful practical outcome. Questions relating to the introduction of plants or to the improvement of the live-stock industry in any region, for example, are now being investigated with a strict relation to the real requirements

of the agriculture of that region, which would have been impossible a few years ago. The present activity in plant breeding, as distinguished from the indiscriminate testing of varieties, is a good example of the raising of the level of experiment-station work as applied to directly practical ends. The plant breeder now sets definitely before him the kind of variety needed by the farmer in a given region or for a given purpose and applies all his scientific knowledge and practical skill to the production of such a variety. The notable success of some of the efforts in this direction already made are but a foretaste of much wider practical results as knowledge and experience in this line of endeavor increase. To do such work effectively there must be an almost ideal combination of science and practice. And the more we can learn definitely regarding the underlying principles the more surely will we be able to make successful practical applications. In such investigations science becomes more practical and art more scientific.

Problems of station organization.—Much attention has been given during the past year to questions relating to the more perfect organization of the stations. As the stations develop, the importance of a clearer definition of the functions of different officers in administration and investigation becomes more apparent. Conditions which existed when institutions for higher education and research were established in this country have materially changed, and the old forms of organization are now, in many cases, a serious hindrance to their best development. For example, the theory on which the laws relating to the governing boards of many of the State colleges and experiment stations are based is that the board is to have the direct control and management of the institution. For this purpose it is to meet frequently, keep the details of the business of the institution well in hand, consult freely with officers of various grades, and pass rules and regulations governing every operation. This may, perhaps, have been well enough when the institutions were in a formative period and trained executive officers were scarce, but to-day this theory is out of date, and its application to the intricate and specialized business of our colleges and stations is highly injurious to their best interests. It works just as badly when applied to a college or experiment station as it would in the case of a railroad or a bank. The fact is that boards of control are most useful when their functions are confined to a broad, general supervision of the policy, finances, and work of the institution and the choice of its chief officers. For this purpose annual or semiannual meetings would ordinarily be sufficient, since the number of matters requiring the attention of the board should be reduced to a minimum. The best reason for the continuance of such boards is that when composed of broad-minded and successful citizens they represent the best sentiment of the community regarding these institutions, and are able to give the public an adequate guaranty for the wise and liberal management of the great interests involved in the State colleges and universities. Otherwise it would probably be best to do away with the boards and make the heads of the colleges directly responsible to some State officer of high rank. One especially annoying and unjustifiable feature of the present system is the maintenance at many of the colleges of an officer, commonly designated secretary of the board, who acts as a representative of the board in the intervals between their meetings and exercises important functions relating to the business of the institution independently of its president. There is thus divided responsibility in the daily administration, and in case of friction between the president and faculty or students often a convenient center for discontent and disloyalty is ready at hand. All the legitimate functions of a secretary of the board might easily be performed by a registrar or other officer attached to the president's office, and thus an important "rock of offense" might be removed from the administrative system of these institutions.

The successful college president is no longer preeminently a great scholar, but rather a broad-minded and well-trained man of affairs, understanding the requirements of modern educational and scientific institutions and able to administer the affairs and manage the personnel of such institutions. He will look to his governing board for advice and counsel on the larger matters of general policy, but he ought not to have their intervention in the details of the business. To his hands should be fully committed the administration of the whole institution, and his work should be judged with reference to its successful issue. There should be no doubt in the mind of any officer connected with the institution that he is responsible to the president for his official conduct, and that an appeal to the board can be made only in extreme cases.

The institution will naturally be divided into a limited number of departments, at the head of each of which will be placed an officer competent to plan and manage the business of the department intrusted to his charge. The amount and character of the administrative duties which these officers will be called upon to discharge will vary with the nature of the department. The agricultural experi-

ment station is by law to be organized as a department of the college with which it is connected. It differs from the ordinary college department in being charged with the work of investigation rather than instruction and in having definite relations with a great industry for whose promotion it is especially established. Through its correspondence, publications, inspection service, and associat on with the farming community it has an increasing amount of business not immediately relating to its investigations, but requiring special knowledge and skill for its successful discharge. To do most effective work the operations of the station proceed in accordance with a well-matured plan which involves the cooperation of different members of the staff. So extensive and important has the business of the stations become that their proper management requires the time and energy of an executive officer, or director. In some cases it may still be possible for the director to conduct investigations in some special line or do a limited amount of teaching, but as a rule he can do litt e beyond attending to administrative duties. In a number of institutions prudential reasons of various kinds have led to the combination of the offices of president and director. Whatever justification there may have been for this in the past there is little excuse for it in the present. The duties of a college president are too multifold and onerous to permit his giving much attention to the special needs of an experiment station. His directorship almost necessarily becomes a nominal affair and the general business of the station is actually performed by some one member of the staff or distributed in a desultory way among a number of subordinate officers. This arrangement has not worked well and should be universally abandoned.

As regards the business of the station, the director should be clothed with a large measure of authority and consequent responsibility, should plan and supervise its work and expenditures, and control its staff to such an extent as will bring them together to work as a unit for the promotion of the station's success. The members of the staff should be directly responsible to the director on all matters re.ating to the station, whatever their position may be in other departments of the college, and should expect to transact station business through the director rather than through the college president or the governing board. A proper independence in the conduct of investigations, or parts of investigation, in their respective specialties and just credit for their share in the station's operations as set forth in publications or otherwise may, it is believed, be amply secured for the expert officers of the stations at the same time that good discipline is maintained and ample provision made for united effort.

No class of men need to readjust their professional code to the modern requirements of the organization of great scientific and educational enterprises more than college professors and scientific specialists. A way must be found by which teaching and research can be conducted on a system which combines liberty with law. The old régime of the entirely independent teacher and investigator has passed away. The specialization which is simply a form of the division of labor well known in industrial pursuits carries with it a necessity for combination of workers in educational and scientific institutions, as well as in manufacturing establishments. In a way hitherto unknown, scientific men will be called in the future to work together for common ends. No matter is of more vital importance in the organization of our colleges and experiment stations than the securing of harmonious and concerted action on the part of faculties and staffs for the common good of the institution to which they are attached. One of the greatest difficulties now attending the successful management of these institutions is the fact that while specialization has narrowed the field and outlook of the individual officer, there has not been a corresponding recognition of the necessity of readjusting the form of organization and the spirit of the worker to meet these new conditions. At no time has there been greater need of the cultivation of an earnest and enthusiastic esprit du corps among the rank and file of educational and scientific workers. There are many individual examples of men impressed with this lofty sentiment, but the whole body is not yet animated with it. Obviously, it should especially be a virtue characteristic of men connected with public institutions. The officers of our agricultural colleges and experiment stations are public functionaries employed to advance very important public interests. With them the good of the community, as involved in the success of the enterprise with which they are connected, should be the ruling motive of action. The fame and emoluments of the individual worker should be subordinated to the requirements of concerted action for a common end. And yet in the long run it is believed the individual worker as well as the institution will profit by a loyal and self-sacrificing discharge of common duties, for union of effort will bring greater success, and whenever a college or a station is strong and flourishing, credit is reflected on every worker who has contributed to this issue.

The general considerations affecting the efficient organization of our experiment stations have thus been dwelt upon because a survey of these institutions during the past year has brought additional evidence that the problems of organization are being more generally considered than ever before. The tide is running strongly toward a more compact organization and a greater unification of the work. On the whole, those stations which have a strong organization and administration are meeting with the largest measure of success.

The original work of the stations.—There is also unusual interest in the discussion of problems relating to the functions of the stations and the specific duties of station officers. There is quite general agreement that each station should conduct a considerable amount of original investigation; but in what way this should be provided for and what should be its character are variously regarded. There is still great variety in the assignments of teaching and investigation to officers in different stations, and the relative amount of work of research which is left to assistants differs very greatly in different places. Considerations relating to the financial conditions of college and station still affect the assignment of work in a number of institutions. Our observation of the situation leads us to the belief that there is actually going on a widespread differentiation of the investigator from the teacher, and that this is not prevented, though it may be hindered, by the varying arrangements made at the colleges and stations. A certain number of men are more and more devoting themselves to the work of investigation and succeeding in it. Others are just as certainly losing their interest and activity in such work. Because a man is required to teach many hours he does not thereby become a successful teacher. The research which he is compelled to carry on during vacations and at night may nevertheless be his real mission, and it will be well if his superiors discover this. The leaving of details of research work to assistants often means that the principal has largely lost his interest in it or considers other duties more important. We are getting an increasing body of competent investigators by this process, though in too many cases their training is proceeding under untoward conditions. It will be well if boards and presidents will consider more fully the actual state of things and make, as far as possible, such a readjustment that the investigator will be left very largely to investigate and the teacher to teach. It continues to be a weakness of a considerable number of our stations that they are organized on too broad a scale for their resources. Too great a portion of their funds is going into salaries, leaving too little to pay the miscellaneous expenses of important investigations. Here and there only have the authorities had the wisdom and courage to confine the operations of the station within comparatively narrow lines, leaving important departments of work entirely without recognition. It is encouraging, however, to observe that where this has been done success has brought additional funds with which the scope of the station's work could be safely extended.

On the whole, the amount of what may fairly be called original investigation is, in our opinion, steadily increasing. To determine this it is not sufficient to consider simply the bulletins of the stations. These have in various ways been made more popular in form and matter. A large amount of the more original work is being recorded in the annual reports and the records of more investigations are being withheld from publication until results of value are obtained. While there is still need of urging the advancement of the general standard of investigations, there is every reason to believe that our stations are moving onward and upward as agencies for the original investigation of agricultural problems.

The inspection service of the stations.—The amount and variety of inspection service required of our experiment stations continue to grow from year to year. Beginning with commercial fertilizers, it now includes feeding stuffs, dairy products and other foods for man, creamery glassware, insecticides, nursery stock for injurious insects, and plant and animal diseases. For a considerable period this matter affected only the stations in the East, where commercial fertilizers were largely used, but it is now a live question in all sections of the country, since there is no region which does not have some evil against which the agricultural public is demanding protection by inspection under State or National auspices. Questions relating to the attitude of the stations toward this work are therefore engaging the attention of station officers throughout the country. Wherever this work has assumed considerable magnitude it is evident that it requires very careful organization in order that it may be conducted so as not to interfere with the work of investigation. Where the same officers are charged with both kinds of work there is constant danger that the severe routine duties of the inspection service will diminish the ability of these officers to conduct thorough original investigation. It is essential that there should be a distinct differentiation of this service from the other work of the stations as regards both funds and time of

performance. Unless this is done and close supervision is exercised, the inspection work is inevitably a drain upon the resources of the station and a hindrance to its more important operations.

While our stations have from the beginning been engaged in inspection work, and this has met with increasing popular favor because of its efficient performance, it is still doubtful whether it is the best ultimate arrangement. Almost all our experiment stations are organic parts of educational institutions. As such they are essentially university departments devoted to research and the dissemination of new knowledge. To a certain extent they may naturally and properly engage in the various forms of university extension work through their more popular publications and connection with farmers' institutes, etc. They are organized to conduct investigations on a great variety of subjects, and the scope of their work of investigation can be almost indefinitely extended as their funds increase. They do not need, therefore, to go outside of that work which would be universally considered within their rightful domain as departments of colleges and universities in order to secure a wide field of operation. On the other hand, as the range of inspection service enlarges and its duties become more onerous and complicated it becomes very questionable whether this service should be connected with our educational institutions. It is essentially a part of the police functions of the State and National governments. It involves many questions on which sooner or later the courts will have to pass. It may even excite public attention to such an extent as to be reckoned worthy of consideration by the people in their choice of administrative and legislative officers. In many ways this kind of business is much more appropriate to bureaus of the State government than to educational institutions.

Thus far the arrangement by which much of it has been connected with the experiment stations has been largely a matter of convenience, and in many States the amount of work to be performed has been so inconsiderable that it has not seemed worth while to create special agencies for its performance. We have now reached a stage in the development of this work when it is believed that this matter should receive careful attention from the managers of our agricultural colleges and experiment stations, in order that a sound policy may be established which will provide for the best future development of these institutions. In our judgment this would involve efforts to relieve the colleges and stations of the inspection service rather than to increase its scope at these institutions and make it a permanent portion of their work.

Statistics of the stations.—Agricultural experiment stations are now in operation, under the act of Congress of March 2, 1887, in all the States and Territories. As stated elsewhere in this report, agricultural investigations in Alaska have been continued with the aid of National funds; an experiment station under private auspices is in operation in Hawaii; and Congress has appropriated $10,000 for the establishment and maintenance of an experiment station under Government auspices in Hawaii and $5,000 for a preliminary study of questions relating to the establishment of an experiment station in Porto Rico. In each of the States of Connecticut, New Jersey, and New York a separate station is maintained wholly or in part by State funds; in Louisiana three stations are thus maintained; and in Alabama two—the Canebrake and Tuskegee stations—are maintained wholly by State funds. Excluding the branch stations established in several States, the total number of stations in the United States is 57. Of these, 52 receive appropriations provided for by act of Congress.

The total income of the stations during 1900 was $1,170,857.78, of which $719,999.07 was received from the National Government, the remainder, $450,858.71, coming from the following sources: State governments, $247,281.46; individuals and communities, $2,420.51; fees for analyses of fertilizers, $70,927.31; sales of farm products, $90,088.84; miscellaneous, $40,140.59. In addition to this, the Office of Experiment Stations had an appropriation of $45,000 for the past fiscal year, including $12,000 for the Alaskan investigations. The value of additions to the equipment of the stations in 1900 is estimated as follows: Buildings, $89,416.23; libraries, $10,784.70; apparatus, $19,397.85; farm implements, $17,015.86; live stock, $22,009.10; miscellaneous, $8,850.94—total, $167,474.68.

The stations employ 693 persons in the work of administration and inquiry. The number of officers engaged in the different lines of work is as follows: Directors, 71; chemists, 143; agriculturists, 71; experts in animal husbandry, 14; horticulturists, 75; farm foremen, 24; dairymen, 30; botanists, 55; entomologists, 50; veterinarians, 29; meteorologists, 16; biologists, 6; physicists, 7; geologists, 6; mycologists and bacteriologists, 17; irrigation engineers, 7; in charge of substations, 10; secretaries and treasurers, 57; librarians, 10, and clerks, 51. There are also 30 persons classified under the head of "miscellaneous," including superin-

tendents of gardens, grounds, and buildings, apiarists, herdsmen, etc. Three hundred and twenty-seven station officers do more or less teaching in the colleges with which the stations are connected.

The activity and success of the stations in bringing the results of their work before the public continues unabated. During the year they published 386 annual reports and bulletins, which are many more than are required by the Hatch Act. These were supplied to over half a million addresses on the regular mailing lists. A number of stations supplemented their regular publications with more or less frequent issues of press bulletins. These are short popular articles which are prepared at little expense to the station, but which, through the medium of the local agricultural press, reach a wide circle of readers and bring the station and the practical results of its work pointedly before the public.

The stations are being consulted more and more by farmers, and the information given is of the most varied character. This necessitates a voluminous and constantly increasing correspondence. Station officers come into personal contact with farmers at farmers' institutes, where they make addresses and answer questions. Many persons are thus benefited by the stations' work who would not otherwise be reached.

The results of station work are further given wide publicity by the general agricultural press. These papers not only give numerous popular accounts of the work of the stations, but they often employ station officers to answer questions of correspondence and as special contributors. Station officers are also frequent contributors to scientific journals. A number of books by station officers has been published during the year.

COOPERATION OF THE STATIONS WITH THE DEPARTMENT.

The number and variety of cooperative enterprises between the different Bureaus and Divisions of this Department and the experiment stations have been greatly increased during the past year. Much progress has also been made in determining the principles on which successful cooperation must be based and the best methods of arranging and conducting such operations. Experience has shown the desirability of a thorough preliminary discussion of the cooperative plans and the final making of a definite formal contract for the work to be actually undertaken. It has also been made clear that such contracts should be made through the directors of the stations and the officers of this Department having general responsibility for the work to be undertaken. The plan which is now generally followed in arranging for cooperation is substantially as follows:

Through preliminary correspondence or personal conferences the officers of the Department and the stations immediately concerned in the proposed cooperative enterprise discuss the terms of cooperation, with the understanding that their action is in no way binding on either the Department or the station. When the plan of cooperation has thus been devised a tentative contract is drawn which is submitted to the director of the station and the chief of the Bureau or Division of the Department having general charge of the work. After the contract is reduced to a form satisfactory to both these parties it receives their signatures, and is then submitted to the Secretary of Agriculture and becomes effective through his approval. It is understood, however, that as far as this Department is concerned no actual operations will be begun under such a contract until the proper commissions and letters of authorization for the expenditure of funds have been issued by the Department in the usual form. Copies of these contracts are filed in this Office as well as in the offices of the contracting parties. This Office also keeps a record of all cooperative enterprises between the Department and the stations and aids the officers of the Department and stations in arranging the details of the cooperative agreement whenever its assistance is sought. Whenever new enterprises

are undertaken there are, of course, many details which have to be worked out for each case as it arises, and no general rules can be devised which will cover all such matters, but with the general principles and methods well established there is, as a rule, comparatively little difficulty in arranging the details of cooperation.

Without doubt great progress has recently been made in bringing the Department and the stations into closer touch, and through their cooperation important investigations for the benefit of agriculture in many parts of the country have been greatly strengthened. The records of this Office show that the Department is at present cooperating with the stations in 43 States and Territories. Among the subjects on which cooperative investigations are being conducted are the following:

Tests of varieties of grasses and forage plants in many localities; special experiments with grasses and forage plants for the arid region and the improvement of range lands; breeding experiments with plants, especially cereals; experiments with hybrid orange trees; the culture of sugar beets, dates, and tobacco; planting forest trees; the nutrition of farm animals and man; the gluten content of wheat; plants poisonous to stock; soil investigations; injurious insects, especially the codling moth and locust, and irrigation investigations.

The following is a list of the cooperative enterprises between the Department and the stations as at present recorded in this Office. Besides the more formal enterprises which involve the expenditure of more or less money on both sides, this list includes a number of minor operations for which no formal contracts have been made:

Summary of cooperative enterprises between the Department and the stations.

Station.	Bureau, Office, or Division.	Line of work.
Alabama	Plant Industry	Hybridization of orange trees.
	Chemistry	Potash—methods of analysis.
Arizona	Plant Industry	Plant breeding.
	Chemistry	Influence of environment on the sugar content of muskmelons.
	Plant Industry	Improvement of desert ranges.
	Plant Industry	Culture of dates.
	Soils	Alkali-soil investigations and soil mapping.
	Experiment Stations	Irrigation investigations.
California	Chemistry	The gluten content of wheat.
	Chemistry	Soils—methods of analysis.
	Chemistry	Influence of environment on the sugar content of muskmelons.
	Plant Industry	Planting and testing of sand-binding plants.
	Experiment Stations	Nutrition investigations.
Colorado	Entomology	Codling moth.
	Chemistry	Influence of environment on the sugar content of muskmelons.
	Chemistry	The gluten content of wheat.
	Forestry	Tree planting.
	Plant Industry	Forage crops for alkali and arid soils.
Connecticut (State)	Soils	Tobacco investigations.
Connecticut (Storrs)	Experiment Stations	Nutrition investigations.
Delaware	Chemistry	Influence of environment on the sugar content of muskmelons.
	Plant Industry	Cover crops for orchards.
Florida	Chemistry	Food analysis of pineapples.
	Chemistry	Phosphoric acid—methods of analysis.
	Plant Industry	Hybridization of orange trees.
Georgia	Plant Industry	Hybridization of orange trees.
Idaho	Entomology	Codling moth.
Indiana	Chemistry	Influence of environment on the sugar content of muskmelons.
	Chemistry	The gluten content of wheat.
	Chemistry	Sugar-beet investigations.
Iowa	Chemistry	Sugar-beet investigations.
Kansas	Plant Industry	Pasture and range improvement.
	Forestry	Tree planting.
	Plant Industry	Improvement of cereals, etc.

Summary of cooperative enterprises, etc.—Continued.

Station.	Bureau, Office, or Division.	Line of work.
Kentucky	Chemistry	Influence of environment on the sugar content of muskmelons.
	Chemistry	The gluten content of wheat.
	Chemistry	Sugar-beet investigations.
Louisiana	Entomology	Certain grasshopper outbreaks.
	Plant Industry	Hybridization of orange trees.
Maine	Plant Industry	Plant breeding.
	Experiment Stations	Nutrition investigations.
Maryland	Plant Industry	Cereal investigations, and a varietal test of sweet potatoes.
	Chemistry	Influence of environment on the sugar content of muskmelons.
	Chemistry	The gluten content of wheat.
	Plant Industry	Influence of origin of red clover seed on yield of crop.
	Plant Industry	Best crops for use in securing a continuous soiling series for dairy and farm stock.
	Soils	Chemical study of soils, and soil survey.
Michigan	Chemistry	The gluten content of wheat.
	Chemistry	Sugar-beet investigations.
	Plant Industry	Influence of origin of red clover seed on yield of crop.
	Plant Industry	Best grasses for fixing drifting sands.
	Soils	Cooperation to a certain extent in the selection of areas and regarding base maps.
Minnesota	Forestry	Tree planting.
	Plant Industry	Improvement of wheat industry of the Northwest.
	Experiment Stations	Nutrition investigations.
Mississippi	Chemistry	Nitrogen—methods of analysis.
Missouri	Chemistry	The gluten content of wheat.
	Plant Industry	Influence of origin of red clover seed on yield of crop.
	Plant Industry	Formation and management of meadows and pastures.
	Experiment Stations	Irrigation investigations.
Montana	Plant Industry	Stock-poisoning plants of Montana.
	Forestry	Tree planting.
	Experiment Stations	Irrigation investigations.
Nebraska	Plant Industry	Cultivation and improvement of native grasses.
	Forestry	Tree planting.
	Plant Industry	Determination of the effects of influence of environment on plants.
	Entomology	Injurious locusts.
	Entomology	Injurious grasshoppers and grasshopper fungus disease.
	Experiment Stations	Irrigation investigations.
Nevada	Experiment Stations	Irrigation investigations.
New Hampshire	Plant Industry	Improvement and renovation of worn-out hay and pasture lands.
	Plant Industry	Influence of origin of red clover seed on yield of crop.
New Jersey	Chemistry	Insecticides—methods of analysis.
	Chemistry	Influence of environment on the sugar content of muskmelons.
	Experiment Stations	Irrigation investigations.
	Soils	Cooperation in the selection of areas and regarding base maps.
New York State	Chemistry	Dairy products.
	Chemistry	Sugar-beet investigations.
North Carolina	Soils	Soil survey and the establishment of test farms.
	Chemistry	Ash—methods of analysis.
	Chemistry	Influence of environment on the sugar content of muskmelons.
	Chemistry	Sugar-beet investigations.
	Plant Industry	Varietal test of sweet potatoes and hybridization of orange trees.
North Dakota	Plant Industry	Influence of origin of red clover seed on yield of crop.
	Plant Industry	Improvement of wheat industry of Northwest.
Oklahoma	Forestry	Tree planting.
Oregon	Plant Industry	Best grasses for fixing drifting sands.
	Plant Industry	Stock-poisoning plants of Oregon.
	Plant Industry	Influence of origin of red clover seed on yield of crop.
Pennsylvania	Animal Industry	Animal nutrition, involving the construction of a respiration calorimeter.
South Dakota	Forestry	Tree planting.
	Plant Industry	Renewing of worn-out pasture lands, etc.
Tennessee	Plant Industry	Influence of origin of red clover seed on yield of crop.
	Plant Industry	Formation and management of meadows and pastures.

Summary of cooperative enterprises, etc.—Continued.

Station.	Bureau, Office, or Division.	Line of work.
Texas	Plant Industry	Best and most practical ways for the formation of meadows and pastures.
	Forestry	Tree planting.
	Chemistry	Influence of environment on the sugar content of muskmelons.
	Plant Industry	Improvement of wheat industry in Middle States of the Great Plains.
	Entomology	Mexican cotton-boll weevil.
	Soils	Selections of areas.
Utah	Experiment Stations	Irrigation investigations.
	Chemistry	Sugar-beet investigations.
	Forestry	Tree planting.
	Plant Industry	Grasses and forage plants for arid and alkali soils.
	Soils	Alkali soils, seepage, and drainage investigations.
	Experiment Stations	Irrigation investigations.
Vermont	Experiment Stations	Nutrition investigations.
Virginia	Chemistry	Methods of manufacture of cider.
	Chemistry	Sugar-beet investigations.
	Soils	Soil survey.
Washington	Plant Industry	Improvement of the Northwestern ranges.
West Virginia	Entomology	Insects injurious to forests.
Wisconsin	Chemistry	Sugar-beet investigations.
	Plant Industry	Influence of origin of red clover seed on yield of crop.
	Experiment Stations	Irrigation investigations.
Wyoming	Plant Industry	Grasses and forage plants for alkali soils.
	Plant Industry	Plant breeding.
	Experiment Stations	Irrigation investigations.

EXPERIMENT STATION EXHIBIT AT THE PARIS EXPOSITION OF 1900.

The collective experiment station exhibit at the Paris Exposition of 1900, made under the general supervision of a committee of the Association of American Agricultural Colleges and Experiment Stations, working in cooperation with this Office, was described in my report for 1900. At the close of the exposition this exhibit was packed for shipment under the supervision of Mr. J. I. Schulte, of this Office, and arrived in this country in good condition.

EXPERIMENT STATION EXHIBIT AT BUFFALO PAN-AMERICAN EXPOSITION OF 1901.

The experiment station exhibit made at the Paris Exposition was transferred to Buffalo in the spring of 1901 and with some additions was installed at the Pan-American Exposition. Owing to the limited amount of space in the Government building available for the exhibits of this Department, only that portion of the experiment station exhibit which illustrated the functions of this Office was installed in the Government building. By the courtesy of the general officers of the Pan-American Exposition the remainder of the station exhibit was placed in the agricultural building, where it was located in immediate conjunction with the exhibits made by the New York State and Tennessee experiment stations. In this way the different functions of our experiment stations were more fully illustrated. A considerable amount of work was done by this Office in remodeling the Paris exhibit and installing it at Buffalo. This work was in charge of Dr. C. F. Langworthy.

AMERICAN INSTITUTIONS FOR AGRICULTURAL EDUCATION.

THE COLLEGES.

Considerable progress has been made during the past year in broadening and strengthening the agricultural courses in these institutions.

The movement for the division of the general subject of agriculture into specialties to be taught by different instructors still continues. For example, the college of agriculture of the University of Illinois, having received additional financial support, has reorganized its agricultural course and added several members to its faculty, so as to divide the teaching of the different branches of agriculture among a number of specialists. The industrial college of the University of Nebraska has also introduced new courses in agronomy and animal husbandry and has established a department of dairy husbandry.

The committee on methods of teaching agriculture of the Association of American Agricultural Colleges and Experiment Stations, of which the Director of this Office is a member, has completed its syllabus for a college course in agriculture by presenting outline courses in agrotechny (especially dairying), rural engineering, and rural economics. Thus far comparatively little attention has been given to the two latter branches of agricultural instruction in our colleges. There is, however, good reason to believe that with the increase of the resources of these institutions more adequate courses in these important subjects will be provided. The beginnings of a movement in this direction are seen in the recent establishment of a department of irrigation at the University of California and the offering of a special course for irrigation canal superintendents and State water commissioners at the State Agricultural College of Colorado. Provision has also been made at the University of Wisconsin for a course of lectures on agricultural economics.

There has been a considerable increase in the total number of students attending agricultural courses in the colleges, but a great majority of these students are unwilling or unable to complete the four years' course leading to the bachelor's degree. There is an increasing demand for short and special courses, and the colleges are meeting this to a greater extent than heretofore. A much larger amount of college extension work in agriculture is now being done than ever before. In the States in which this work has been in progress for a number of years it is being continued, and many institutions in other States are following the example of the pioneers in this line of education. This work is also assuming a considerable variety of forms. The following are some recent examples of this tendency:

The Alabama Polytechnic Institute has begun the publication of short articles in local newspapers. The agricultural department of the State Agricultural College of Colorado has begun the publication of "Agricola Aridus," a bimonthly magazine for college-extension work; also of press bulletins. The faculty and staff of the Delaware college and station have begun giving nature-study lectures. The School of Agriculture of the Nevada State University has begun the publication of nature-study leaflets. The Rhode Island College of Agriculture and Mechanic Arts makes exhibits at county fairs, furnishes notes on the station for agricultural papers, sends members of its staff to visit prominent farmers, has inaugurated correspondence courses, and begun the introduction of nature study in rural schools. The State Agricultural and Mechanical College of the University of Tennessee has prepared a permanent exhibit for sending to meetings of farmers to illustrate the work of the station. The State Agricultural and Mechanical College of Texas has begun the publication of press bulletins and notes. The faculty of the West Virginia University have undertaken nature-study work. The North Dakota Agricultural College and Experiment Station have prepared instructive

exhibits for fairs in the State and also a number of permanent exhibits to be displayed in public places. Through the efforts of this college nature study is now being taught in all the training schools for teachers, and all the high schools of the State will offer courses in agriculture. The excursions to the college and station brought in about 1,700 farmers this year. The details of these excursions were all arranged by the director of the station, who obtained a merely nominal fare on the railroads and even planned the running of the excursion trains.

In providing for maintenance and new buildings at the agricultural colleges, the various State legislatures meeting during the past year have been more than usually liberal. At the last session of the Kansas legislature over $200,000 was appropriated to the State Agricultural College for new buildings and other improvements and maintenance. Of this sum, $70,000 will be expended in the erection of a new physics and chemistry building, and $10,000 for additions to the library. The appropriations of the Minnesota legislature for its college of agriculture aggregate this year over $90,000, of which $25,000 will be used for a new chemical building, $25,000 for a new veterinary building, $12,000 for additions to the women's dormitory, and $7,500 for instruction and experiments in curing meat. Colorado has provided $40,000 for the erection of a new irrigation engineering building. The Michigan Agricultural College has recently completed a women's building costing $95,000, a dairy building costing $15,000, a barn costing $4,000, and the State legislature at its last session provided for an annual levy of one-tenth mill on the taxable property of the State, which will yield $100,000 per annum for the support of the agricultural college, experiment station, substations, and farmers' institutes. In North Dakota a levy of one-fifth mill on the taxable property of the State will provide additional funds for the maintenance of the agricultural college. A special appropriation of $50,000 for buildings has also been made by the legislature. The College of Agriculture of the University of California has at its disposal $250,000 per annum for two years. The legislature of Indiana has provided $60,000 for a new agricultural building at Purdue University and $10,000 a year for two years for maintenance and equipment of the same. The College of Agriculture and Mechanic Arts of the University of Missouri has been provided by the Missouri legislature with $40,000 for a dairy and live-stock building, $40,000 for a horticultural building and equipment, and other minor appropriations, making a total of over $100,000 for the agricultural work of the university. At the New Hampshire College of Agriculture and Mechanic Arts $30,000 provided by the legislature will be expended in the erection of an agricultural building. The Oklahoma assembly has levied taxes to raise $46,000 for the construction of an engineering building and for additions to the library at the Oklahoma Agricultural and Mechanical College. Washington Agricultural College has an appropriation this year of nearly $120,000; $25,000 for a chemical building, $10,000 for an armory, nearly $25,000 for other improvements, and $60,000 for maintenance. The South Dakota Agricultural College has an appropriation of $40,000 for an engineering and physics building and $10,000 for a building for work in plant breeding. The University of Idaho has received $50,000 for a science hall and girls' dormitory. In Wyoming the legislature gave the State university $36,000 for a science building. This institution is also receiving $15,000 a year from the rent of its lands. In Montana a fund of $16,000 has accumulated from the rent of lands belonging to the agricultural college.

The financial and statistical reports of the colleges receiving appropriations under the act of August 30, 1890, which in accordance with the law are regularly forwarded to the Secretary of Agriculture, have, as hitherto, been deposited in this Office. On the basis of these reports and replies to special circulars of inquiry, this Office has published statistics relating to the agricultural colleges for the year ended June 30, 1900. Reports for the fiscal year ended June 30, 1901, have now been received.

SECONDARY AND ELEMENTARY SCHOOLS.

One of the most hopeful signs to those interested in agricultural education is the effort on the part of the faculties of agricultural colleges and of others charged with the education of our youth toward the development and support of secondary agricultural schools and the introduction of nature study and elementary agriculture into the rural schools. Alabama continues to support nine Congressional district agricultural high schools, which annually accommodate about 2,000 pupils at a cost to the State of $22,500. Minnesota has for a number of years supported a successful secondary school of agriculture in connection with the State university, and the legislature of 1901 appropriated $2,000 a year for two years for the introduction of agriculture into the rural schools. The University of Nebraska has recently inaugurated a similar school of agriculture with a three-year course. A recent law in Wisconsin provides for the establishment of county agricultural high schools. In Missouri increased attention is being given to carrying out the provisions of the law requiring agricultural instruction in rural schools, and to prepare teachers for this work departments of agriculture have been established in the three normal schools of that State, located at Cape Girardeau, Kirksville, and Warrensburg. Through the efforts of the committee for the promotion of agriculture of New York a school of practical agriculture and horticulture has been put into successful operation at Briar Cliff Manor, N. Y.

In many States the problem of improving the rural schools is causing general discussion, and there seems to be a marked tendency toward concentration, that is, the elimination of small schools and the establishment of centralized schools, often with free transportation for pupils living at a distance from the schoolhouse. This movement has in several cases resulted in the establishment of rural high schools, with the township or the county as a unit. Reports coming from sections where centralization has been tried show for these schools better supervision, better teaching, better buildings and other facilities for instruction, better health and morals on the part of the pupils, more regular attendance, a longer continuance of the large boys and girls in school, and considerably enriched courses of study. These courses of study at the present time are in the formative state; they are merely outlined, or, at most, in the first years of experimental development. Means for improving them are eagerly sought and thoughtful suggestions receive careful consideration.

The time seems favorable, therefore, for the Department to take a more active part in encouraging the introduction of nature study and elementary agriculture into the curricula of rural schools, with the idea of developing the natural tendencies of the pupils to observe and take an interest in the natural phenomena surrounding them, and of fostering in them a love for the country and its pursuits. Such encouragement may be given by cooperating with departments of

education in the publication and distribution of suggestive courses of study and of a bibliography of works that would be helpful to teachers, by distributing seeds and plants for use in establishing school gardens, by furnishing schools with collections of specimens of beneficial and injurious insects, plant diseases, and other illustrative material, by supplying teachers with the publications of this Department which would be useful to them, and by such other means as would suggest themselves as the work progressed. The Department might also do much to promote the great movement for the betterment of country life by timely articles on this subject in its Yearbook and other popular publications.

FARMERS' INSTITUTES.

As the work of the experiment stations has developed it has become very evident that in addition to their publications there is needed a thorough system for the prompt and efficient dissemination of their results directly to the farmers through oral communications. To understand and appreciate the station bulletins the farmers must in many cases be taught something of the elements of agricultural science and must have their objections to the introduction of new methods of farming met and overcome by personal contact with the living teacher. This need has already been partially met by the farmers' institutes.

These institutes had their origin in farmers' societies of various kinds, some of which date back half a century or more, but State aid to such meetings is mostly confined to the last thirty years. The participation of the State in giving itinerant instruction to farmers is largely the result of efforts put forth by members of agricultural college faculties in different parts of the country. In Iowa this work was begun as early as 1869; in Vermont, Michigan, and some other States, a few years later. In nearly every case these early institutes were supported by funds diverted from the regular college funds. That there was a demand for farmers' institutes is shown by the increasing appropriations for their support. In 1891 nearly $80,000 was spent for farmers' institutes in the United States, but of this sum not more than $60,000 was specifically appropriated for this purpose. In 1899 the specific appropriations for institute work aggregated $140,446.72, more than twice the sum thus appropriated in 1891, and the estimated expenditure of funds derived from other sources was $30,000, making a grand total of more than $170,000 expended for 2,000 farmers' institutes, which were attended by over half a million farmers.

Farmers' institutes are now held in 43 States and Territories. In 19 of these the institutes are under officials of agricultural colleges or experiment stations, in 17 they are under State or county officials, and in 7 they are under the joint control of State officials and college or station officials. Successfully conducted institutes are found under each system of management. In Wisconsin, for example, institutes are held under the auspices of the board of regents of the State University. About 120 institutes are held each year and the aggregate attendance is about 55,000. Each institute extends over two days, except the last, which is a three-day round-up institute. For the support of these institutes the State legislature appropriates $12,000 a year. Agricultural college officials do a limited amount of work at a few of the meetings. In Michigan the legislature has placed farmers'

institutes under the control of the State board of agriculture, which has charge of the agricultural college. The director of the experiment station is superintendent of institutes. The meetings are held under the auspices of county institute societies, the officials of which indicate their choice of State speakers from a list sent them by the superintendent, and then, after the superintendent's assignments are made, arrange for local speakers and provide accommodations. There are held annually about 70 two-day county institutes, 100 one-day meetings, and the three-day State round-up institute. The total attendance at all sessions is upward of 100,000 annually. For the last biennial period, 1898–1900, the legislature appropriated $11,000 for institutes, but hereafter the State board of agriculture will set aside whatever is needed for this work from an appropriation of $100,000 placed under their control for the support of the agricultural college, the experiment stations, and college extension work. Several members of the college and station staff devote a portion of their time to institute work.

New York and Pennsylvania have State control of farmers' institutes. In the former State the work is under the auspices of the commissioner of agriculture, who appoints a director of institutes. About 300 meetings are held each year, and the total attendance is 75,000, or more, annually. The appropriation for 1898–99 was $20,000 per annum. In Pennsylvania the institutes are held under the direction of the deputy secretary of agriculture, who is director of institutes. The meetings are distributed according to the number of farms in each county—two-day institutes to every county having not over 1,000 farms, three-day institutes to each county having more than 1,000 but not over 1,500, afterwards one day for each 1,500 farms or fraction thereof additional. About 300 institutes are held each year, and the total attendance is over 50,000. The annual appropriation for institutes is $12,500. Three or four members of the college staff and two members of the board of trustees give their whole time to institutes for a period of about three months.

In some European countries itinerant instruction for farmers is very thoroughly organized. In Belgium the department of agriculture sends out lecturers who give 15 lectures between October and March in each of about 230 communes, provided there is an attendance of not less than 15. The state pays the expenses of these lectures and grants reduced railway fares to persons traveling to attend; the commune supplies the room for the lectures and advertises the date and place for them. Prizes of books are given as an encouragement to attend. This system of lectures does not interfere with the system of occasional lectures given by State agriculturists and numerous specialists on different subjects connected with agriculture. In France there are over 100 departmental professors of agriculture who, besides giving courses in agriculture in public normal schools, where teachers for rural primary schools are trained, also hold at least 26 institutes each year. The lectures given are for the purpose of enlightening the cultivators regarding seeds and varieties, fertilizers, new implements, selection and feeding of animals, treatment of old and new vineyards, insect ravages, drainage, etc. In both countries the lecturers superintend numerous demonstration fields on private estates where ocular demonstrations of the advantages of modern methods in agriculture are given.

The farmers' institute movement in the United States is an important one, and is yearly becoming more important. Attendance at the

meetings is increasing and appropriations are becoming more liberal. Indiana's appropriation for the current year is double what it was last year; Montana has made its first appropriation for institutes, $2,000; Tennessee, Maryland, and Missouri have increased their appropriations by $1,000 to $2,000 a year, and other States have made minor changes for the improvement of their institute systems.

The farmers' institute movement has now reached such a stage of its development as makes it apparent that the comparatively simple methods hitherto followed in the organization and maintenance of the institutes are not adequate for an enterprise of such magnitude as this has become. Many problems regarding better organization and further development of the institutes have arisen, the solution of which will require much study involving the comparison of methods employed in different States and countries. In its national and international aspects there is room for much useful work by this Department, which may well aid in this as in other movements for the education of our farmers and the improvement of our agriculture. As the farmers' institutes are already closely identified with our agricultural colleges and experiment stations, it seems to me that it would be entirely proper for this Office as the central agency for the promotion of the interests of these institutions to also undertake the active promotion of the interests of the farmers' institutes. In this way the Department might accomplish much useful work in aiding to extend the institutes to regions where they have not hitherto been held, to strengthen the movement where it is weak, and to secure more efficient organization where its value is already appreciated by the people. I have therefore recommended (see p. 177) that Congress be asked for an appropriation of $5,000 to enable this Office to undertake this work. For this purpose there should be attached to this Office an officer who can devote his time to conferring with the institute managers in the different States, attending representative institutes in different parts of the country, studying the problems of institute organization at home and abroad, and giving advice and assistance wherever opportunity offers.

ASSOCIATION OF AMERICAN AGRICULTURAL COLLEGES AND EXPERIMENT STATIONS.

The fourteenth annual convention of this association was held at New Haven and Middletown, Conn., November 13–15, 1900. The Director of this Office was a delegate and was also reelected bibliographer of the association. The Office was further represented by the assistant director, Dr. E. W. Allen. The stenographic report of the proceedings was prepared under the supervision of the Director, and has since been edited by him and Mr. W. H. Beal, of this Office, and the chairman of the executive committee of the association, and issued as Bulletin No. 99.

The committee on the collective experiment station exhibit at the Pan-American Exposition made its final report, in which it was recommended that the exhibit be kept intact and installed as a permanent exhibit at some place in the city of Washington.

Reports were made by the committees on methods of teaching agriculture, indexing agricultural literature, and graduate study at Washington, D. C. The Director of this Office has performed a considerable amount of work during the past year as a member of the four committees above mentioned.

The committee on cooperative work between this Department and the stations made a report, which was adopted by the association. This report commended the attitude of the Secretary of Agriculture toward closer cooperation between the Department and the stations, and pointed out the different ways in which the two institutions might aid each other. It also outlined the principles on which, in the opinion of the committee, joint work could be arranged and conducted.

The twenty-fifth anniversary of the establishment of agricultural experiment stations as State institutions was celebrated at Middletown, Conn., where the first of these stations was established. On this occasion interesting and valuable papers were presented by Dr. W. H. Jordan, of New York, on American Agricultural Experiment Stations, and by Prof. W. O. Atwater on the History of the Connecticut Experiment Stations.

A carefully prepared and eloquent address on the career of the late Justin S. Morrill, of Vermont, was delivered by Dr. G. W. Atherton, of Pennsylvania. Dr. Bernard Dyer, of London, England, attended the convention as the representative of the Lawes Agricultural Trust, and delivered a course of three lectures based principally on the investigations at the Rothamsted Experiment Station of soils which have been in continuous wheat culture. It is expected that these lectures will be published later through this Office. Besides resolutions of thanks to Dr. Dyer, the association adopted a memorial expressing its high appreciation of the life and work of the late Sir John Bennet Lawes and his associates at the Rothamsted station.

RELATIONS WITH FOREIGN INSTITUTIONS.

During the year the relations of this Office with foreign institutions for agricultural education and research have become more intimate through correspondence and exchange of publications, and much reliable information regarding these institutions has been made available. A card catalogue of foreign agricultural colleges, secondary schools of agriculture, and experiment stations, giving references to the available literature on these institutions, has been prepared, the list of foreign experiment stations has been revised and published, and the work of writing, for publication in bulletin form, an account of the organization, equipment, expenditures, and work of the 700 stations in this list has been nearly completed. Closely related to this work was an article on Agricultural Education in France, written for the Yearbook of the Department, by Mr. C. B. Smith, of this Office.

Instances of governmental activity for the advancement of agriculture are numerous, both in the Old World and in the New. In Russia the ministry of agriculture has inaugurated a system of commissioners of agriculture—one for each of twenty provinces or governments—who will correspond in a general way to our commissioners of agriculture or to secretaries of State boards of agriculture. With each commissioner's office will be connected a corps of agricultural specialists, who will work among the landowners and peasants.

In England the agricultural-education committee is doing an important work for agriculture and agricultural education by publishing circulars on various topics and teachers' leaflets on "Nature knowledge" (nature study), and the number of private institutions for research has been augmented by the establishment of the Aynsome Experiment Station at Lancashire by Mr. John S. Remington.

The Austrian Government has recently established several experi-

ment stations, notably the station for plant culture at Brünn, a station for investigations in plant and animal production at Otterbach, and an agricultural physiological station with divisions of chemistry, physiology, and bacteriology at Prague. In Hungary an experiment station for wines was established last year at Fiume.

France has established an œnological station at Toulouse and a colonial garden at Nogent-sur-Marne. The latter will have administrative control over French colonial stations and botanic gardens, and will furnish these institutions with seeds and plants.

In Germany five years of successful work at the Lauchstadt Experimental Farm, which is connected with the experiment station at Halle, under the direction of Dr. Max Maercker, have given so much evidence of the value of experimental farms in connection with experiment stations that there is a movement in that country toward the extension of the so-called "American system" of field experiments conducted on a large scale and in a more practical way than has hitherto been customary at experiment stations there.

A department of agriculture, with a small staff of experts, has been organized at Bangalore by the government of Mysore, India.

In the West Indies and South America, also, the claims of agricultural education and research have received a large share of attention. Meetings in Barbados have shown great interest in agricultural education, and in the course of the year three new experiment stations have been established at Montserrat and one at Tortola. The Bolivian Government has established an agricultural college at Cochabamba and an agricultural school for Indians at Umala. Brazil has recently established a botanical garden and experimental demonstration field at San Vicente, and the Argentine Republic has decided to establish four experiment stations on the same general plan as those in the United States.

Publications of the Office.

During the year the Office issued 52 documents, aggregating 3,843 pages. These include 14 numbers of the Experiment Station Record, with detailed index, 18 bulletins, 5 farmers' bulletins, 1 report, 2 Congressional documents, 3 circulars, 3 articles for the Yearbook of the Department, and 6 special articles published as separates.

Experiment Station Record.

General editorial management of the Record has been intrusted to the assistant director, Dr. E. W. Allen, during the past year, as heretofore, and he has also continued to act as chairman of the abstract committee of the Association of Official Agricultural Chemists. Volume 12 of the Record was completed, and the preliminary work on the combined index to the first 12 volumes was accomplished. Even with the condensation which has been adopted in this combined index, it includes upward of 100,000 separate entries. The combining of these so as to bring the related references together under suitable general entries, in order to make it a practical working index, remains to be done. It is hoped that the index may be made ready for the printer during the coming year.

The Experiment Station Record has a value for two purposes, (1) as a record of current investigation on agricultural science, and (2) as an annotated bibliography of recent work. Its value, with its

detailed index, as a means of looking up work which has been done on a particular subject, increases with each volume issued. The combined index, which is in preparation, will furnish a full subject index to experiment station work since the passage of the Hatch Act, and to a very large proportion of the contemporaneous investigation along lines related to agriculture.

The demand for the Record has necessitated a small increase in the edition during the year. Its circulation is, as before, confined to such persons as are engaged in agricultural research or instruction, under a fairly broad interpretation. The foreign list is sent largely in exchange at present and results in an increasing amount of periodical literature, experiment station reports, separates, and scientific papers which materially assist in following up the foreign literature of agricultural science.

The review of the literature of agricultural science in the Record is made more complete and comprehensive year by year, and the development of various agencies for agricultural investigation adds constantly to the material to be reviewed. During the past year no less than 1,500 scientific journals, periodicals, and serials have been followed up systematically, some of these being weeklies. In addition to these a very large number of reports of municipal, State, and Government experts, commissions, and boards from all over the world have been reviewed. That the great amount of labor involved in the issuing of the Record is not misdirected is evidenced by the place which it has taken among abstract journals and by the use which is being made of it by the nearly two thousand experiment station investigators, agricultural instructors, and public officials who receive it. Fewer leading articles were included in the last volume than in some of the previous volumes owing to a lack of available space. Several valuable articles have been secured whose publication it was necessary to postpone. This pressure of material has made it necessary to print the Record in a smaller type in order to gain space. Beginning with Volume XIII brevier type has been used in place of long primer, which will enable about one-third more material to be printed without increasing the number of pages.

The twelfth volume of the Experiment Station Record comprises 1,205 pages, and contains abstracts of 348 bulletins and 55 annual reports of experiment stations in the United States and 158 publications of the Department of Agriculture. The total number of pages in these publications is 31,268. The total number of articles abstracted is 3,271, classified as follows: Chemistry, 172; botany, 158; fermentation and bacteriology, 38; zoology, 31; meteorology, 99; air, water, and soils, 135; fertilizers, 139; field crops, 353; horticulture, 320; forestry, 130; seeds and weeds, 80; diseases of plants, 248; entomology, 334; foods and animal production, 314; dairy farming and dairying, 181; veterinary science, 347; technology, 25; agricultural engineering, 56; statistics and miscellaneous, 121.

Special articles were also published in this volume of the Record as follows: "Notes on horse feeding," by E. Lavalard; "New agricultural building at Kansas State Agricultural College;" "International congresses of horticulture, viticulture, and agriculture at Paris," by W. H. Evans; "New building for the College of Agriculture at the University of Illinois," and "Russian soil investigations."

There are condensed accounts of the Proceedings of the Fourteenth Annual Convention of the Association of American Agricultural Colleges and Experiment Stations, by E. W. Allen, of this Office, and

of the Seventeenth Annual Convention of the Association of Official Agricultural Chemists, 1900, by D. W. May, of this Office; and in addition, editorial discussions of the following topics: The promotion of agriculture in Russia, agricultural experiment stations for Hawaii and Porto Rico, international congresses of agricultural experiment stations and of agricultural education at Paris, the late Sir John Bennet Lawes, the influence of the Rothamsted Experiment Station, experiment station exhibits at the Paris Exposition, need of more perfect organization of the experiment stations, differentiation of the investigator from the teacher, some recent bibliographic helps, protection of crops from hail, the scope and management of the veterinary work of the experiment stations, investigation of soils in Russia, variety testing at Woburn Experimental Fruit Farm, cheese curing in the light of the enzym theory, the agricultural appropriation act, experiment-station farms and the movement for their establishment in Germany, the Hawaii experiment station, and Maxime Cornu, botanist, horticulturist, and agriculturist.

MISCELLANEOUS PUBLICATIONS.

The miscellaneous publications of the Office consists chiefly of (1) technical bulletins and reports, and (2) Farmers' Bulletins, including the series known as Experiment Station Work, and are prepared under the immediate editorial supervision of Mr. W. H. Beal.

TECHNICAL BULLETINS.

Organization Lists of the Agricultural Colleges and Experiment Stations in the United States, with a List of Agricultural Experiment Stations in Foreign Countries (Bulletin No. 88, pp. 181), contains a list of the officers of the Association of Agricultural Colleges and Experiment Stations and of the Association of Official Agricultural Chemists; a list of institutions having courses in agriculture in the United States, with courses of study and boards of instruction; a list of experiment stations in the United States, with governing boards and station staffs; a list of experiment stations in sixty-seven foreign countries, with their location and directors; a list of station publications received by the Office of Experiment Stations during 1900; Federal legislation affecting agricultural colleges and experiment stations, and regulations and rulings of the Federal departments affecting the stations. The bulletin contains a complete index of names.

A Report on the Work and Expenditures of the Agricultural Experiment Stations for the year ended June 30, 1900 (Bulletin No. 93, pp. 181, pls. 8). This contains the report of the Director, which is referred to elsewhere (p. 181).

Fourth Report on the Agricultural Investigations in Alaska, 1900, by C. C. Georgeson, special agent in charge of Alaska investigations (Bulletin No. 94, pp. 83, pls. 24). The investigations reported in this bulletin are referred to elsewhere (p. 202).

Report on the Agricultural Resources and Capabilities of Hawaii, by William C. Stubbs, director of the Louisiana Agricultural Experiment Stations (Bulletin No. 95, pp. 100, pls. 28). The subject-matter of this report is discussed on page 207.

Statistics of the Land-Grant Colleges and Agricultural Experiment Stations in the United States for the year ended June 30, 1900 (Bulletin No. 97, pp. 37), shows the number of officers and students, endowment, equipment, and revenue of the colleges, and the number of officers,

revenues, expenditures, lines of work, additions to equipment during the year, and number of publications of the stations.

Agricultural Resources and Capabilities of Porto Rico, by S. A. Knapp (House Doc. No. 171, Fifty-sixth Congress, second session, pp. 32, pls. 7). A report on investigations of the agricultural resources and capabilities of Porto Rico, with special reference to the establishment of an agricultural experiment station in that island. The report discusses the climate, soils, and industrial conditions of the island; the agricultural and horticultural products, especial attention being given to the sugar, coffee, and tobacco industries; the character of labor and farm wages; the agricultural depression and the possibilities of agriculture in the island, and makes recommendations regarding agricultural investigations.

Proceedings of the Fourteenth Annual Convention of the Association of American Agricultural Colleges and Experiment Stations, held at New Haven and Middletown, Conn., November 13–15, 1900 (Bulletin No. 99, pp. 192, pls. 3), contains, in addition to the proceedings of the convention, papers, addresses, and reports on a number of subjects of interest to students and investigators in agricultural science. The proceedings were edited for publication by the Director and Mr. W. H. Beal, of this Office, and the chairman of the executive committee of the association. A limited number of separates of the principal papers contained in the bulletin have been printed.

Agricultural Education in France, by C. B. Smith (Yearbook of the Department of Agriculture, 1900, pp. 115–130), describes the system of agricultural education in that country.

A brief statement regarding other bulletins issued in connection with the investigations in nutrition and irrigation may be found on pages 221, 229, respectively.

FARMERS' BULLETINS.

Beans, Peas, and Other Legumes as Food, by Mary Hinman Abel (Farmers' Bulletin No. 121, pp. 32, figs. 10). Beans, peas, lentils, and other legumes, used fresh or dried, as articles of diet, are described, and their food value as compared with other vegetables and with animal foods is discussed. The principles which govern the cooking of leguminous vegetables are treated, and statistics are given of the use of such foods and their importance in the diet.

Eggs and Their Uses as Food, by C. F. Langworthy (Farmers' Bulletin No. 128, pp. 32), describes different kinds of eggs used for food, and summarizes the available information regarding their composition and uses and value as articles of diet.

There was also submitted for publication during the year Irrigation in Field and Garden, by E. J. Wickson (Farmers' Bulletin No. 138, pp. 40, figs. 18), which gives practical directions for the construction of small ditches, the collection, storage, measurement, distribution, and application of water for the use of the individual farmer.

EXPERIMENT STATION WORK.

Two numbers (Nos. XVI, XVII, Farmers' Bulletins Nos. 122, 124) of Experiment Station Work, the subseries of brief popular bulletins compiled from the published reports of the agricultural experiment stations and kindred institutions in this and other countries, were issued during the year, and a third number (XVIII, Farmers' Bul-

letin No. 133) was submitted for publication. In the preparation of these bulletins the effort has been made to take into account the work done at the different experiment stations and to compare results obtained under different conditions, so as to present a more complete view of the progress of investigation in special lines than could be given by abstracts of the reports of single investigations. While it has been our effort to show the practical application of these results, we have also tried to so present them as to make clear to the reader that our articles are intended to be essentially reports of progress in agricultural investigations rather than final and authoritative recommendations of changes in farm practice. It is believed that one of the most important things which our farmers have to learn is that they are not to follow blindly the advice of experts whose investigations have necessarily covered only certain features of the complex problems of practical agriculture. The farmer should be made acquainted in a broad way with the results of investigations carried on by the experiment stations and kindred institutions, and taught how to take advantage of the results of these investigations through his own knowledge and skill as applied to the conditions existing on his own farm. The popularity of these bulletins is evidenced by the large and increasing demand for them, necessitating frequent reprints.

CARD INDEX.

Copy for 1,900 cards of the index of experiment-station literature has been prepared in the Office and forwarded to the Division of Publications during the year. Preparation of the index is now kept as nearly up to date as the irregularity of publication of station documents will permit. The number of index cards distributed has reached 21,500. The receipts from sales of this index during the year were $163.76.

BIBLIOGRAPHICAL WORK.

The Office has cooperated with the Library of the Department in the preparation of a list of works on irrigation, land drainage, and closely allied subjects, which is now ready for the printer. A list of Russian dissertations on veterinary subjects has been completed during the year by a member of the Office force, and bibliographies of the botany of maize and nitrogen assimilation, and the sources of data relating to ash analyses of American farm products have been added to. Considerable additions have also been made to the bibliography of nutrition of man and animals, especially of bread and closely allied topics.

The collection and cataloguing of publications of the agricultural colleges and experiment stations in this and other countries have been continued during the past year as heretofore. A large number of foreign publications of all kinds has been received as exchanges. Many duplicates of station and other publications were received, a considerable number of which were distributed to college and station libraries and officers. The number of requests from college and station officers for the loan of books from the Department Library has greatly increased. The service thus rendered by the Department is greatly appreciated by these officers, many of whom do not have access to large libraries, and it is hoped that hereafter such privileges may be further extended.

Work for the Civil Service Commission.

The Director of this Office has continued to act as the general representative of the Department in matters relating to examinations held by the Civil Service Commission for technical and scientific positions in the Department. The number of papers received from the Commission, recorded in this Office, and rated by examiners in the Department during the year was 260. Besides the regular examinations 22 special examinations were held during the year. The register for "scientific aids," confined to graduates of the land-grant colleges, continues to be a useful one, and an increased number of appointments has been made from it during the past year. In some branches of the service the number of eligibles on this list has not kept pace with the demand. The "scientific aid" register has, however, to a considerable extent taken the place of the register for "assistants," and for that reason the regular examinations to fill the latter register have been discontinued. A plan for combining the "scientific aid" and "assistant" registers with a view to providing a system for the entrance of competent "scientific aids" into the classified service has been approved by the Commission. The partial reorganization of the Department due to the establishment of new bureaus has caused a temporary increase in the number of special examinations.

Experiment Stations in Alaska.

The fourth appropriation for agricultural investigations in Alaska was made for the fiscal year beginning July 1, 1900, but a portion of this appropriation was made available in the spring of that year. The appropriation was $12,000, and its terms were the same as those in the previous year, authorizing the Secretary of Agriculture to expend this fund "to investigate and report to Congress upon the agricultural resources and capabilities of Alaska, and to establish and maintain agricultural experiment stations in said Territory, including the erection of buildings and all other expenses essential to the maintenance of such stations."

Prof. C. C. Georgeson has been continued as special agent in charge of these investigations, with assistants at Sitka and Kenai, in the coast region, and Rampart, in the interior. The chief new feature of the investigations during the past year has been the more thorough study of the agricultural possibilities of the interior, especially the Yukon Valley. For this purpose Professor Georgeson made a journey through the interior between June 19 and September 18, 1900. A detailed account of this investigation was given in Professor Georgeson's report for 1900 (Bulletin No. 94 of the Office of Experiment Stations), of which he has made the following summary:

I was accompanied by one assistant, Mr. Isaac Jones, who was to remain in the interior and take charge of the work we might undertake there. We went in via Skagway, over the railroad to White Horse, and by boat down the Yukon to Dawson, at which place we arrived July 3. We found no boats at Dawson going down the river, none having come up from St. Michael at that time. I therefore bought a scow, in which we packed our outfit, and I hired a man to help us navigate it and sent it adrift down the river on the evening of July 5. We stopped at Eagle, the first town in American territory, and at Circle City. At the latter place we were compelled to abandon the scow and take a boat, for the reason that we doubted our ability to work it through the stretch of 300 or more miles across the Yukon Flats. We found small gardens both at Eagle and Circle, and at the former especially these gardens were numerous and promising. We found that potatoes and nearly the entire list of hardy vegetables were doing nicely.

At Circle we took a boat for Fort Yukon. There being vast stretches of level land in this region, I made a reservation of 106 acres for an experiment station. This occupied us some days, and while waiting for a boat we broke up a small piece of sod with a view to having it in readiness for seeding this year, should we find it practicable to begin experimental work there.

Continuing down the river, we examined the conditions wherever the boat stopped. At Rampart the conditions seemed favorable for an agricultural experiment station. A tract of land on the north side of the river, directly opposite the town of Rampart, seemed well adapted to the purpose. It was more or less densely covered with spruce forest, but some clearings had been made by wood choppers, and it was thought that by judicious handling of fire a portion of the tract could be cleared and put under culture without incurring too great expense. I therefore made a reservation at this place, having a mile frontage on the river and running back half a mile. Some cabins which had been built by Indians and others near the river bank were cut out by offsets, so the reservation proper comprises about 313 acres. When this work was completed we again dropped down the river as far as Weare, some 80 miles below Rampart. At this point we had an opportunity to examine the Tanana country by taking advantage of the opportunity afforded to go up the river in a little Government boat belonging to Fort Gibbon. There appeared to be much available farming land in this region, but, as was the case on the Yukon, the best land was rather heavily timbered, chiefly with spruce and also with birch and balsam poplar. We ascended the Tanana for about 100 miles, but I made no reservation in this region.

On returning to Weare, Mr. Jones went up to Rampart and began work on the reservation made there. I continued down the river to St. Michael, stopping at the usual landing places.

The most successful gardening which came to my notice on the trip was at Holy Cross Mission, some 350 miles from the mouth of the Yukon. At this mission there is about 4 acres under culture, and the missionaries are very successful in growing potatoes, cabbage, cauliflower, turnips, carrots, parsnips, lettuce, radishes, and, in fact, the entire list of hardy vegetables. I was there on the 7th of August, but little over two months after the gardens were planted, and they had fine cabbage and vegetables of many kinds.

The superintendent of the mission, Father R. J. Crimont, agreed to undertake some experiments in grain growing during the present year. Seed grain was accordingly furnished him and the general plan of experiment agreed upon. I also provided him with a set of soil thermometers, and he promised to keep a record of the soil temperature at that place during the present season.

At St. Michael General Randall, commanding the Department of Alaska, kindly provided me with transportation on the transport *Lawton* to Seattle. The *Lawton* was at Nome discharging freight, and I had to go over there to catch her.

At Dutch Harbor and Unalaska I saw fine gardens and an abundance of cultivated flowers, and quite a number of cattle, sheep, hogs, and poultry, indicating that stock raising and gardening could be carried on in that region with marked success. There is an abundance of pasture on the Alaska Peninsula and adjoining islands, grass having taken the place of spruce forest so universal in southeast Alaska.

During the present summer Professor Georgeson has gone again into the interior, and under date of August 15, 1901, reports that while at the Holy Cross Mission, on the Yukon River, during the second week in August, the mission was supplied from its own garden with new potatoes, cauliflower, cabbage, and other vegetables, and that on the station reservation at Rampart "rye seeded last fall wintered perfectly, and it was ripe early this month. Barley, spring seeded of course, is now ripe enough to grow. Oats and spring wheat are somewhat later, but they are filling out and may ripen. Mr. Jones also planted a long list of vegetables, but they have been nearly totally destroyed by rabbits, and what is left of the lot have not grown well in the new soil, again confirming our oft-repeated experience that it requires some two or three years to get new soil in proper tilth for vegetables. Mr. Jones has agreed to go out over the trail from Eagle to Valdez, and we shall thus have an authentic description of that interior country."

Mr. Jones is unwilling to remain longer in the Department service;

but an arrangement has been made with Mr. J. W. Duncan, a resident of Rampart, to care for the station property there and do some fall and spring seeding.

At Sitka the experiments with cereals, forage crops, and vegetables were continued during the season of 1900, and a considerable number of varieties were successfully grown. An extensive series of experiments was conducted with fertilizers, illustrating their effect on new soil, as shown in the production of oats, barley, and potatoes. During the present season similar experiments have been continued, and an attempt has been made at growing forage crops for the maintenance of the station cattle. The experimental cropping the present season has been confined to those varieties which have been successful heretofore, the object being to secure Alaska-grown seed for the use of the station and for distribution in small quantities among residents. Some fertilizer experiments with seaweed, stable manure, and fish guano are under way.

A successful experiment was made in the construction of a log silo and the preparation of silage. Regarding this, Professor Georgeson writes as follows:

> A log silo was built during July and August, 1900, by my assistant, Mr. Rader. A silo was needed, and it was built of logs as an experiment, in order to ascertain if settlers could build a satisfactory silo by this means. It is 15 by 15 feet square inside and 13 feet high. The logs are fitted together and chinked with moss in such a manner as to make the walls perfectly air-tight. The logs were dressed on the inside so as to present a smooth wall. It was roofed with boards, and a temporary cattle shed for the cattle was built against one side. The silo is built in the side of a hill, with a driveway over the hill at the back, so that the material can be pitched over the top log of the silo without much exertion. It was filled with native grasses during the latter part of September. The experiment was an entire success. Our work oxen were fed exclusively on silage from November 10 to May 1, and only when they were worked were they fed grain in addition. They ate the silage with relish throughout and were maintained in good condition. There was no greater loss of silage by waste than always occurs in preserving green forage.

During the past year some advance has been made toward building the station headquarters at Sitka, but unfortunately the appropriation for the current year will not permit the completion of this building. Only the first story is in a condition to be used at present, and the exterior of the building is still unfinished. The necessary plumbing was done in this building during the past winter by Professor Georgeson and his assistant, when it was found through bids that this work could not be otherwise done except at excessive cost. A rain-water tank holding 4,700 gallons was constructed near the building in a similar way. It is estimated that by doing the work in this manner some $500 was saved.

During March of the present year the station force "cut a raft of wood in a bay some miles from town and towed it in with the launch. It will supply most of the fuel needed during the present year."

During the present summer the station force at Sitka has also built a barn and four-room cottage on the station farm. The barn joins the silo and is 25 by 50 feet and two stories high. The lower story will have a tool room, furnish storage for farm implements, and have stalls for half a dozen head of cattle. The upper story is provided with a tight floor and will be used chiefly for the handling of grain and seed. The cottage is 16 by 30 feet and a story and a half high. There are at present only two rooms on each floor, but it is contemplated to build a kitchen as an addition to one side later on. This cottage is needed to provide quarters for the man who has charge of the cattle and who

can look after the numerous things which require constant attention at the farm.

Considerable work has also been done on a drainage system for the station farm. The launch *Wave*, transferred from the Navy Department to this Department and assigned to the Sitka station, needed considerable repairing before it could be made serviceable. These repairs were made by Mr. Rader. The little boat was then made fairly seaworthy, and has since been of much use to the station in procuring grass, wood, etc., as well as for transportation.

At Kenai experiments with cereals and vegetables have been continued with considerable success. A number of varieties matured during the season of 1900. Some fall-seeded rye and wheat survived the past winter in fair condition. The greater portion of the grain seeded last spring at this station is from grain grown there last year and the year previous, which indicates that grain can be matured and propagated in that latitude. Between 5 and 6 acres have been cleared and fenced and are in culture. About 3 acres of this were cleared last year and are cropped this year for the first time.

During the past year the assistant in charge of the station has built a five-room log house for the use of the station. All the work at Kenai has been done by Mr. H. P. Nielsen, the assistant in charge, and one laborer. Mr. Nielsen deserves great credit for the energy and faithfulness which he has shown in doing a large amount of hard and rough work under difficult circumstances.

Professor Georgeson visited the Kenai station in June of the present year, and writes as follows regarding the climatic conditions there:

> A new difficulty has arisen in connection with our experiments at Kenai, and that is a drought during the spring. This has been the case during the past two years. There was moisture enough in the soil to start the seed growing, but on account of dry weather the growth has been slow up to the present time (July 17). During the month of June the rainfall amounted to only .06 of an inch. I do not know whether the past two years represent the average of the seasons in the Kenai Peninsula in that respect. If they do, this feature will be a greater obstacle to successful farming than cold weather.

Besides the experimental work at Sitka and Kenai, seeds have been distributed to over 400 persons living in different parts of Alaska, and a considerable number of reports have been received from those grown there during the season of 1900. There is a considerable increase in the demand for seeds now that it is known that they are being distributed through the station. Not only are vegetables, cereals, and forage plants asked for, but there is a considerable demand for flower seeds. There seems to be a great desire on the part of a certain class of explorers in Alaska to cultivate flowers, which are more than ordinarily prized in a region where the general conditions of life are so comparatively hard.

Professor Georgeson has continued to supervise all the voluntary observers of the Weather Bureau of this Department in the coast region of Alaska. These observers send their monthly reports to the station at Sitka, where one copy is kept on file, while another is sent to the chief of the Weather Bureau at Washington.

In connection with the annual visitation of the experiment stations in the different States and Territories, Dr. E. W. Allen, the assistant director of this Office, went to Alaska during the present season and has made the following report of his observations there:

> In connection with a tour of the experiment stations in the Northwest, I proceeded to Alaska during the month of July for the purpose of examining the condition and work of our agricultural experiment stations there. My visit was con-

fined to the coast regions, as time would not permit a trip into the interior. Stops were made at Wrangell, Juneau, and Skagway on the way up to Sitka, and after a brief stay at the latter place I made a trip to the westward as far as Cook Inlet and Kadiak, returning thence to Seattle. The trip to the westward gave opportunity for inspecting the work of our station at Kenai, for looking over the reservation at Kadiak, and for observing what is being done in the line of gardening at various points along the route.

The impression which I gained from this Alaskan trip was that not only is a quite wide range of gardening and some measure of agriculture possible, as has been shown by the Congressional reports of our experiments there, but that a gratifying amount of educational and demonstration work has been done among the people, which is already productive of good results. A number of private residences about Sitka show what can be accomplished by well-directed industry in beautifying them and in maintaining creditable home gardens. Many of the natives plant gardens of vegetables and flowers, and a considerable number give them fairly good care. Near the town men were engaged in making hay on a small tract, and, with the weather prevailing at the time of my visit, it was quite practicable to dry the hay in the field. Numerous gardens containing lettuce, radishes, cabbage, peas, potatoes, and the more hardy vegetables generally were to be seen at the various places where I landed along the way. These gardens were for the most part well cared for and usually an object of pride. The quality of the vegetables raised was said to be excellent, and failures were few with persons who understood the best methods. At Kenai the gardens of the natives presented an especially well-cared-for and thrifty appearance. In many places the natives have come to appreciate the value of vegetable food in improving their diet, and the variety which a garden of fresh vegetables lends to the food of the newer residents of Alaska is much appreciated by them. Flower beds of sweet peas, pansies, and a number of other kinds of plants were not uncommon.

The seed for planting these gardens and the directions and encouragement for maintaining them have come very largely from the special agent in charge of the Alaska station and his superintendents. Everywhere I went along the coast region I found that the work of the Alaska stations was well known and usually very favorably regarded at present, although many admitted that they had at first viewed the undertaking with much skepticism. Hardly a man was addressed who did not know about Professor Georgeson and his work. This is the more remarkable and stronger evidence of the interest which has been aroused when it is considered that there are practically no newspapers in Alaska having more than a local circulation, that no publications except Congressional reports have been issued, and that, owing to the difficulties of transportation, people do not get about as much as they do in the States. The extent to which information has been diffused and the confidence of the people won speak much for the vigor and industry with which the work has been prosecuted. The propaganda has met with a good measure of success, and the work now has many strong friends, particularly in the western coast region, where the conditions are the most suitable for agriculture.

I was impressed with the many difficulties which our agent has had to meet in carrying on his work under such pioneer conditions, at a number of points widely separated. Transportation is entirely by water and is slow; mails are infrequent; the need for material of various kinds must be anticipated several months; labor of the right kind for our work is very difficult to procure; the work must be accomplished in a short summer season, and a thousand and one little annoyances arise to hinder and discourage the undertaking. It is only through untiring energy and enthusiasm for the work and the exercise of the strictest economy that Professor Georgeson has been able to make the good showing that he has for the time and money he has had at his disposal. I do not hesitate to say that, despite these difficulties and the higher prices to be met, few, if any, of our experiment stations in the early years of their existence have been able to make a better showing for the money expended in the way of buildings, permanent improvements to the land, and amount of experimental work performed than the Alaska stations do to-day, and the interest and confidence which have been aroused by the stations are worthy of any station in the newer States.

Now that such favorable results have been obtained with vegetable growing and some of the cereals, I am of opinion that work might be undertaken with animals to show the extent to which feed for them can be profitably or economically grown in Alaska. Fresh meat is scarce and dear; it is only occasionally that fresh meat can be obtained to the west of Sitka. With small animals, like poultry, useful work might be done in showing what feeds can be grown for them and how they can best be cared for. Poultry raising would be the simplest beginning in animal production and might lay the foundation for work with larger animals. The hog is not commonly found, but summer pasturage for hogs could surely be

raised, and it seems very probable that winter feed could be grown also. The profitableness of hog raising in a small way and the quality of the pork which could be produced without corn would be a good subject for investigation. Cattle raising and milk production have been tried as a business venture on a small scale at a few places. In most instances, however, the feed for the animals has been very largely shipped in, and it remains to be demonstrated to the satisfaction of the people at large, at least, that the necessary grain and feed can be profitably raised, so that products of good quality can be made without relying upon feeds imported from Puget Sound.

From the experience already had, I am inclined to regard the raising of cattle for beef and for milk production in Alaska as entirely feasible. There are good pastures in places, and natural meadows where hay of good quality can be made. From a commercial point of view the present freight rate on live cattle from Seattle to the Cook Inlet region would give the local cattle raiser the advantage of a protective tariff. Kenai or Kadiak seem well adapted to experiments of this nature, and are representative of quite large areas of country. I would recommend that the building up of a herd of cattle with reference to conducting experiments in the feasibility and profitableness of beef and milk production, using home-grown products to the largest possible extent, be taken up as soon as circumstances and the funds at disposal for this work will permit. In the meantime the distribution of seeds of varieties of plants found especially adapted to Alaskan conditions should be continued, with the possible dissemination of information, in the form of popular circulars or bulletins, regarding the progress of the work and directions for preparing and caring for gardens.

With the present appropriation it will be impracticable to do more than continue the investigations in Alaska on the lines on which they are now being conducted. Additional funds are required for the completion of the headquarters building at Sitka, for the erection of small buildings at Rampart and the equipment of the station there, for the employment of an expert horticulturist, whose services are greatly needed, and for the purchase of live stock. The annual appropriation for the regular expenses of the Alaskan work should be at least as much as that for the experiment stations in the other Territories, namely, $15,000. In addition to this, I would recommend an appropriation of $5,000 to be used for buildings and the purchase and transportation of live stock.

Experiment Station in Hawaii.

The first appropriation for the establishment and maintenance of the agricultural experiment station in Hawaii was made for the fiscal year covered by this report. The appropriation was $10,000 and provided for the erection of buildings and all other expenses essential to the maintenance of an agricultural experiment station, including printing (in Hawaii), illustration, and distribution of reports and bulletins. With a view to determining the conditions existing in Hawaii with reference to experimental investigations as related to the needs of the agriculture of that Territory, and the location of an experiment station, Dr. W. C. Stubbs, director of the Louisiana Agricultural Experiment Stations, was sent to Hawaii, as stated in my previous report, where he made a careful investigation with special reference to the organization and work of an experiment station. His detailed report was transmitted to Congress in January, 1901, and published as House Document No. 368 (Fifty-sixth Congress, second session), and afterwards as Bulletin No. 95 of the Office of Experiment Stations. Besides much valuable information regarding the agriculture of Hawaii, this report contains definite recommendations regarding the location, equipment, organization, and lines of work of the proposed experiment station in that Territory. It was recommended that the station be established under the direct control of

the Secretary of Agriculture and independent of existing local institutions. As the station already maintained by the Hawaiian Sugar Planters' Association will continue its work on problems relating to the sugar industry, it was recommended that the station to be established by this Department give its attention to other agricultural interests. It was pointed out that among the subjects to which the station should give special attention were the culture of fruit, vegetables, rice, forage crops, stock raising, dairying, coffee growing, irrigation, and forestry.

As the headquarters for the station, it was recommended that the reservation which the Hawaiian government had surveyed and mapped in 1893 for an experimental and forestry station be secured. This is a tract of 222 acres near Honolulu, known as Kewalo-uka, with an elevation ranging from 50 to 1,000 feet, and containing cleared and forest land.

On the basis of this report, a second appropriation of $12,000 was made for the maintenance of an experiment station in Hawaii during the current fiscal year. Immediately on the passage of this appropriation act, which showed the determination of Congress to put the project of an experiment station in Hawaii on a permanent basis, Mr. Jared G. Smith, chief of the Section of Seed and Plant Introduction of this Department, was transferred to this Office and appointed special agent in charge of the Hawaii Experiment Station. He left Washington near the end of March and proceeded without delay to Honolulu, with instructions to establish headquarters there and to begin the organization of regular experiment station work in Hawaii. As a site for the station, he was to secure possession of the tract of land in Honolulu known as Kewalo-uka, and on this to begin the clearing and fencing of land and the erection of buildings. In making plans for experimental work, he was instructed "to consider especially the needs of the people of the Hawaiian Islands as regards the production of food supplies for home consumption, and the development of animal industry, dairying, and coffee culture, and to extend aid to the people of the different localities throughout the islands for the improvement and development of local agricultural industries through the distribution of seeds, plants, and publications, the giving of advice by correspondence and otherwise, and the institution of cooperative experiments." He was urged to enlist the cordial support and sympathy of the Hawaiian government and people in this enterprise, and he was to announce that it would be the policy of the Department "to encourage the granting of financial assistance to the station by the Hawaiian government, as in the case of the other States and Territories, where the National funds have been largely supplemented by local grants of money for buildings, equipment, and current expenses of the station."

On examination of the records of the Hawaiian government before the annexation of this Territory to the United States, it was found that while there were evidences of the intention of that government to reserve the Kewalo-uka tract for experimental purposes, the reservation had never actually been completed. Soon after the annexation of the Territory, on recommendation of the Secretary of the Navy, the President issued a proclamation (November 10, 1899) reserving 20 acres, more or less, of the best agricultural land on this tract as a site for a naval hospital, and on recommendation of the Secretary of the Treasury another reservation of 7 acres had been similarly made as a site for a hospital for the Marine Hospital Service. Through the cour-

tesy of the Secretary of the Navy, this Department has been granted the temporary use of the naval hospital site for experimental purposes. After negotiations with the government of the Territory of Hawaii, the larger portion of the Kewalo-uka tract was definitely set aside for the use of the experiment station to be conducted under the direction of the Secretary of Agriculture in the proclamations issued by the acting governor of the Territory.

About 50 acres of land have been cleared, and half of this area has been plowed and harrowed. This includes 13½ acres of forest land on the upper portion of the reservation, where there is sufficient rainfall to make it possible to carry on experiments without irrigation. This will be devoted to horticultural plantations, and in this way will be covered with trees again. A water system has been provided by the erection of several large tanks, which are connected with the city water system and operated with the aid of a gasoline engine and pump. The following buildings are in process of erection: Residence for the special agent in charge, office and laboratory, one frame cottage and two grass huts for laborers, one stable, and one covered manure pit.

Plantings of taro have already been begun, with the special object of studying a disease which plays havoc with that crop. This is a very important matter, since the taro is a principal food plant of the islands. Every part of the plant is eaten at some stage of its growth. The root is large, fleshy, and full of starch, and is exceedingly wholesome and palatable. It grows in marshy lands in the valleys, but there are also varieties suited to upland cultivation. Probably 50 per cent of the working population in these islands depend on taro for their daily food. The fungous disease above referred to cuts down the yield to one-fourth or one-third of the normal average, and is all too prevalent. Within the last decade the price of taro has increased 500 per cent because of the losses by this disease and the attendant deterioration in quality and yield. There are many other fungous diseases of fruits and vegetables prevalent on the islands in Hawaii which should be studied.

Some poultry experiments have also been inaugurated. These could be undertaken immediately without great expense, and it is hoped that they may lead to results of immediate practical usefulness. Largely because of the great number of diseases with which barnyard fowls are afflicted in the Hawaiian Islands the supply of poultry does not meet the demand. Live chickens sell in Honolulu markets for $15 a dozen and eggs at from 40 to 50 cents a dozen. If the station can demonstrate a practical way for the economical production of chickens and eggs it will add largely to the resources of the small farmers on the islands.

Owing largely to the insufficient supply of forage, pork production is very expensive, the ruling price for hogs in the Honolulu markets being from 10 to 17 cents per pound on the hoof. To remedy this difficulty experiments with various tubers and roots and with the common papaya as feed for swine will be undertaken at an early day.

As soon as possible investigations in dairy husbandry will be undertaken. On this subject Mr. Smith reports as follows:

> Dairying and cattle feeding is now being carried on on a small scale with some measure of success, but the supply of milk and butter is insufficient to meet the demands of the home trade. Island butter retails for 60 cents per pound, milk for 12 cents a quart, and Hawaiian-made cheese is almost unknown in the Hawaiian markets. A few of the dairies are managed on a scientific basis.
>
> There is, however, widespread ignorance of the best combinations of feeds and

too great dependence on one-sided rations both in feeding dairy cattle and in fattening animals for the shambles. The use and necessity of leguminous forage plants is not recognized. Enough by-products of the sugar plantations are burned every year to feed all the beef, pork, and mutton consumed in the islands.

Experiments should be conducted in the utilization of the waste cane tops in the form of silage for feeding dairy cattle and beef steers, and with the waste molasses for fattening sheep, cattle, and hogs. On some plantations the work horses and mules are fed cane tops and molasses to good advantage. The practice can with profit be extended to other branches of animal husbandry. But it is of even greater importance that extensive experiments be carried on with forage plants rich in protein, the clovers and beans, to supplement and fully utilize all of the heat and fat-making energy of the cane-top and sorghum rations generally used. The Hawaiian Islands can grow and fatten more than enough animals to supply the home demand. At present considerable importations of cattle, beef, mutton, hogs, and pork are made from the mainland, Australia, and New Zealand. On the contrary, because of the location of the group, Hawaii ought to be able to command a superior market for all her surplus dairy and meat products in the Orient.

Plans are being made for experiments in horticulture, including both fruits and vegetables, and coffee culture. These will include experiments with reference to the methods and times of pruning, methods of cultivation, picking, and marketing, as well as tests of varieties. To show the importance of such investigations, Mr. Smith makes the following statements:

The Hawaiian Islands market depends largely on supplies of fruits from the mainland at all seasons of the year. Not only can enough fruit in sufficient variety be grown to supply the local markets, but both fruit and vegetables might be grown for export. The Honolulu market is usually well supplied with fruits and vegetables, though not always of the best quality nor in large variety, but the plantations, farms, and ranches depend largely on canned products. Work to show the practicability of the growing of a wide range of fruits and vegetables for the home table at a distance from well-filled markets will be profitable and desirable.

It is hoped that experiments in coffee culture and the growing of various spices and drugs may also be undertaken at an early day. On this subject Mr. Smith reports as follows:

Probably $10 000,000 has been sunk in unprofitable coffee cultivation in these islands during the last ten years. An intelligent investigation of all phases of the coffee industry will well repay. Coffee is a white man's crop. It is grown at elevations unsuited to cane and where the climate is admirably adapted to a comfortable and healthful existence.

The coffee lands of Hawaii can be made as productive as any in the world. Experiments in the selection and crossing of varieties to produce more prolific or hardier trees, and especially an investigation of the methods of curing coffee, should be made in an effort to save this industry. Hawaiian coffee has already made for itself an enviable reputation for quality and flavor of berry. If it could be sold on its merits instead of in competition with the low-grade coffees of Brazil and Central America, it would in time prove an immensely profitable crop. An effort should be made to save this industry from total extinction. It is a crop especially suited to the small farmer and the small investor—the man who can build up a home and care for his crop himself. The establishment of the coffee industry on a successful basis would make the Hawaiian Islands a land of small farmers more quickly than the transformation could be accomplished in any other way or through the medium of any other crop or industry. Besides coffee, various spices and drugs could be grown, such as pepper, allspice, ginger, cardamom, cloves, various tannins, kinos, and oils. But with all of these the experiment station must lead the way and show the possibility of profitable culture before the farmers are advised to undertake the cultivation.

Investigations on methods of cultivation and the use of fertilizers and drainage and irrigation are also much needed. On this point Mr. Smith states:

Very little has been done to demonstrate the value of thorough cultivation and the use of commercial fertilizers except in connection with sugar cane. There is

a wide field for work in these two lines. It is a recognized principle that a cane field must be well prepared and a cane crop well cultivated and fertilized to secure the best and largest yields, but with almost all other crops it is taken for granted that the tropical climate will bring the plants to full fruition alone, without adequate cultivation or the use of fertilizers. Water is poured on lavishly and the sunshine and normal high temperatures are expected to do the rest. Problems in soil cultivation, fertilization, drainage, and irrigation must be investigated in their relation to other crops than sugar.

Investigations in forestry are much to be desired, but these can not be undertaken by the station without considerable increase in its resources; and in any case, whatever investigations the station might undertake in this direction should be done in cooperation with the Bureau of Forestry. Regarding this subject, Mr. Smith makes the following statements:

Many of the native woods of this group are extremely valuable from a commercial standpoint and a considerable trade in these woods, notably koa and sandal, at one time flourished. I would recommend that the entire backbone of each main mountain chain of each of the islands be set apart in forest reserves under the Federal Government, in order that the native forests may be protected and preserved and that a modern and legal system of forest conservation may be carried out. The sugar plantations all depend directly or indirectly on the wooded mountain slopes for their water supply, and it is due to their owners that something be done to check the further destruction of the native forests, and also to replant large areas with trees (native and foreign) which shall in the future become commercially valuable.

Considering the variety of subjects for investigation, the annual appropriation for the maintenance of the Hawaii experiment station should be not less than $15,000. To properly equip it with buildings, apparatus, implements, live stock, etc., a special appropriation of $10,000 is very much needed. It was hoped that the legislature of the Territory would follow the example of the other States and Territories in supplementing the National funds for the maintenance and equipment of the station, but though measures looking to this end were introduced they failed to pass.

Porto Rico Experiment Station.

The first appropriation for agricultural investigations in Porto Rico was made for the fiscal year ended June 30, 1901. This appropriation was $5,000 and authorized the Secretary of Agriculture to determine the agricultural conditions existing in that island with special reference to the most desirable localities for agricultural experiment stations, as well as the subjects on which the agricultural people of the island are in most immediate need of practical information, and how this need can be most economically and effectively supplied; but it did not provide for the establishment and maintenance of an experiment station. The preliminary investigation called for by this appropriation was made through this Office by Prof. S. A. Knapp, formerly of the Iowa Agricultural College, and more recently engaged in agricultural enterprises in southern Louisiana. He visited Porto Rico during the summer of 1900 and made his final report in September of that year. This report was transmitted to Congress and published as House Doc. No. 171 (Fifty-sixth Congress, second session). It contains a summarized statement regarding the climate, soil, and agriculture of the island, shows in what ways the experiment station might benefit agriculture, and recommends the establishment of a station as soon as practicable. Professor Knapp advises that the station should give immediate attention to promoting the production of

larger and better crops of coffee, sugar, and tobacco, and food products for home consumption, and that at an early day work should be undertaken in horticulture, forestry, animal husbandry, and dairying. Besides conducting experiments, it should give object lessons in improved farming and should disseminate information by publications and agricultural meetings.

On the basis of this report Congress made a second appropriation ($12,000) for the current fiscal year, which authorized the Secretary of Agriculture "to establish and maintain an agricultural experiment station in Porto Rico, including the erection of buildings, the printing (in Porto Rico), illustration, and distribution of reports and bulletins, and all other expenses essential to the maintenance of said station."

Though this appropriation did not become available until July 1, 1901, Mr. Frank D. Gardner, assistant in the Division of Soils, was transferred to this Office April 15, 1901, and was appointed to take charge of the agricultural investigations in Porto Rico. After spending some time in such preliminary preparations for the establishment and maintenance of an experiment station in Porto Rico as could best be conducted in Washington and vicinity, he proceeded to Porto Rico, arriving in San Juan about the middle of May. The remaining portion of the fiscal year he spent mostly in traveling about the island to familiarize himself with its people and the conditions and needs of agriculture, with special reference to the location of the experiment station and the character of experiments most desirable to undertake. During a portion of this time he was accompanied by Messrs. O. F. Cook and G. N. Collins, of the Division of Botany, who had been temporarily assigned to this Office, and sent to Porto Rico to aid in preliminary studies with reference to the determination of the best lines of work for the proposed experiment station. Mr. Gardner has made the following brief preliminary report on his observations in Porto Rico during these journeys:

To the tourist the island is indeed most attractive and beautiful. This is particularly true of the interior and mountainous parts, which constitute somewhat more than three-fourths of its total area. As a winter resort for tourists from the States and elsewhere it has great possibilities. Better and quicker water communications between the island and States, good hotels at a number of suitable points on the island, and easy communication between them, are the chief requisites which are wanting in order to make the island a most attractive and popular resort.

From the standpoint of the agriculturist there are also good possibilities, but in some respects there are also adverse conditions which present grave difficulties to agriculture, at least when considered in its intensive form.

Chief among these are the rough and rugged topography of much of the land surface, which prohibits in a large measure the use of modern machinery; the torrential character of many of the rains, which in case of cultivated land tends to wash away the surface soil, much to the detriment of the fertility of the land, and then the heavy texture of the soil, which in a wet climate often renders it unfit to cultivate for long periods of time, to the advantage of weeds and to the detriment of crops. Last, but not least, is the lack of roads by which the products of the land can be taken to market.

At present there are areas of 50,000 acres in one body which are inaccessible except on horseback or on foot, and from which the only means of transporting the products is either on the backs of mules or upon the heads of peons. Much money has been spent on roads during the past year and much will be spent the coming year, so that the road question is in a fair way to be solved in time.

The soils of the island vary greatly. About the seashore there is usually present a sandy border varying from a few hundred feet in width to several miles in other places. This is a coarse, light-colored coral sand, and is best adapted to cocoanut palms and pineapples. Between the sandy lands and the mountainous interior occur quite extensive areas of level alluvial lands, which constitute the principal sugar lands. These areas are most extensive near the mouths of larger

rivers, and usually become quite limited midway between them. The sugar lands vary in texture from sandy loam to clay loam, and are as a rule quite productive. Considerable of this land is too wet, especially during the rainy season, to give good results in cane. Much of it is used as pasture land. By adequate drainage this land could all be used for sugar, and its value increased from $30 to $60 per acre as pasture to $100 to $150 per acre as sugar land.

The soil of the sugar lands on the south side of the island is of different origin than that on the north and is deeper, darker, and more sandy. Owing to much less rain there irrigation is necessary.

The acreage in sugar the past year was approximately 80,000, giving an estimated yield of about 90,000 tons. This acreage can be at least doubled, and the yield trebled. The past season has been a prosperous one for the growers, and next year will see the area much increased. Both American and local capital is being put into large new sugar houses, which will replace a large number of the old and wasteful mills that have long been in use. The outlook for sugar is excellent.

The soil of the mountainous interior is usually heavy in texture, although small areas of sand land occur, especially along the streams. The interior country is adapted to coffee, bananas, citrus fruits, and minor crops. Tobacco does well on the sand river lands, and also or some of the steep hillsides.

Of all the industries in the island, none received such a severe setback by the cyclone of 1899 as did coffee culture. The damage to coffee exceeded that of all other crops in the island. Many of the plantations are still in a state of ruin, while others were cleared and put in shape and at the present time have nearly a normal crop. The method of growing coffee is exceedingly crude; there is usually too much shade and the plants are set at unequal intervals and too close together. Very little cultivation is given, and no attention is given to the selection, propagation, and pruning of the trees. By attention to these points great improvement can undoubtedly be brought about in the production of coffee, and the actual cost of production can be much reduced.

Cattle do well They feed on the luxuriant pastures the year round, grow and become fat enough for market with no additional feed. They are but little bothered by flies and other insects, and seem to enjoy comfort the entire year. As work oxen and beef cattle, the breed commonly found on the island seems a very good one, but as milkers they are poor, giving only a small flow of milk, which contains a low percentage of fat. With an extension of the sugar lands and the new impetus which coffee, fruits, and minor crops are likely to receive in the next few years the large areas of pasture are likely to be much decreased, so that the live-stock interests are likely to be reduced rather than increased. Coffee, fruits, and tobacco and the minor crops, and to some extent dairying, should receive the early attention of the station.

As regards the location of the experiment station, more difficulty was experienced in obtaining suitable land than was anticipated. As there is no Government land available it will be necessary either to purchase land with funds appropriated by Congress or to secure financial assistance for this purpose from the insular government or municipalities. There will be no opportunity for getting financial aid from the insular government until the meeting of the legislature next winter. In reply to a circular letter sent to the different municipalities in the island, setting forth some of the advantages of an agricultural experiment station, and asking how much land they would donate for the purpose of establishing an experimental farm in their vicinity, replies, as a rule, stated that the municipalities possessed no lands that in kind and amount would be suited for the purpose, and that their very poor financial condition would not allow them to purchase. Three municipalities, however, made offers of land, but on examination it was found that the land was either not suitable for experimental purposes or too inaccessible. Negotiations are being continued in this matter, but it does not at this time seem probable that land can be obtained without the expenditure of a larger amount than can be used for this purpose from our present appropriation. I am of the opinion that final action on this matter should be deferred until after the meeting of the insular legislature, when an effort should be made to secure local financial aid in the establish-

ment of the station, as in the case of other Territories. I see no good reason why the government of Porto Rico should not supplement the National funds for an agricultural experiment station in the same way. Meanwhile, the headquarters of the station will be maintained at San Juan, and such investigations will be undertaken as can be pursued on lands leased or loaned by residents of the island desiring to engage in cooperative work with the station.

Information regarding the agricultural needs of the island and methods which may be adopted for the improvement of agriculture on the basis of our present knowledge will be collated and published, and the people will be aided in this and other ways to improve the agricultural conditions. Efforts will be made to institute experiments in the culture of coffee and citrus and other fruits. Experiments are much needed to discover effective methods for the extermination of the "changa," a mole cricket that does great damage to many crops. There are also forms of plant lice and scale insects very injurious to coffee and citrus fruits, which should be studied with reference to their repression.

Every effort will be made to expend the funds at present available in useful investigations and in the dissemination of information of value to the agricultural people of Porto Rico. As soon as the question of the location of the station is settled, it is hoped to proceed rapidly with the erection of buildings, the equipment of the station with apparatus, implements, and live stock, and the making of horticultural and other plantations, as well as the institution of experimental inquiries which will place this station on a par with the others in the United States. For the regular maintenance of an experiment station in Porto Rico, as elsewhere, not less than $15,000 will annually be required, and I therefore recommend that Congress be asked to appropriate this sum for this station for the fiscal year beginning July 1, 1902.

Agricultural Investigations in the Philippines.

In my report for 1899 the suggestion was made that as soon as peace and order were established in the Philippines, provisions should be made for an investigation there to determine the needs of the agriculture of those islands and the ways in which these could best be met by the establishment of agricultural experiment stations. With the establishment of civil government over a considerable area in the Philippines the time seems to have arrived to renew the suggestion. In order to determine in a preliminary way the conditions heretofore existing in the Philippines with reference to agriculture and agricultural investigations, I called upon Dr. W. H. Evans, of this Office, to examine Government reports and other works bearing on these subjects and to prepare a summary report thereon. I present his report herewith:

Agriculture in the Philippines does not seem to have prospered as would have been expected in a country possessing such fertile soils and diversified climate. At some time in the history of the islands there have been successfully introduced nearly every important agricultural industry of tropical and temperate climates. After flourishing for a while many have been almost entirely abandoned. To-day a few staple crops are grown to a considerable extent, but of such an important crop as rice, the bread of the islands, not enough is produced to supply the local demands. The growing of rice is better understood by the people at large than any other crop, yet by their primitive methods of culture and crude machines they are unable to supply their own necessities. Of agricultural products, mostly food stuffs, up to 1890, there were imported annually more than $4,000,000 worth,

while the exports amounted to about $14,000,000, principally hemp, sugar, coffee, and tobacco.

A great number of reasons have been assigned for the limited development and retrogression in agriculture. The native people seem to possess little ambition, and are content when their limited requirements are supplied. They grow a little rice, plant a patch of sweet potatoes, and for their other necessities depend to a great degree upon the natural products of the islands. Lack of transportation facilities has been generally considered one of the most serious drawbacks to the development of agriculture. But few roads have been constructed throughout the islands and most of these become almost impassable during the rainy season. Without transportation facilities between the producer and the market, there is little incentive to the growing of bulky crops. A lack of knowledge relating to the proper growing of crops is another drawback. Aside from the production of the so-called manila hemp, the most important agricultural products of the islands are from crops the cultivation of which was introduced by the Spaniards. In the growing of one or two of these, considerable proficiency has been shown, but even for these the crudest, most primitive implements are employed. The principles of agriculture seem wholly unknown, and only a little knowledge regarding the practices as relating to a few crops is followed. Improved machinery is almost unknown and wholly unemployed. Lack of capital, without which no industry can flourish, and the very high rates of interest exacted, tend to prevent the development of small farms and minor industries. Large plantations can obtain loans upon much more favorable conditions than small ones, the titles to which are often defective.

Various attempts have been made to develop the resources of the country. In 1782 a monopoly of the tobacco industry was decreed in several provinces, and a forced cultivation of that crop was attempted. Each family was required to grow and deliver to the Government a certain quantity of tobacco each year, receiving for it a sum determined upon by the officials in charge of the monopoly. Either under private or governmental monopoly this continued for a century, with varying success. In 1882 the monopoly was abolished, and in ten years the exports increased more than 50 per cent. In 1784 a company was chartered by royal decree which gave almost absolute control of the mercantile affairs of the islands to this syndicate. This company, the Real Compañia de Filipinas, was required to expend 4 per cent of its net proceeds upon the development of agricultural resources of the archipelago. Stimulated by the large amount of money expended and the prospect of more to come, many enterprises were begun which flourished for a time. Sugar, coffee, and tobacco plantations were extended on all sides. Indigo, silk, cotton, cocoa, condiments (pepper, cinnamon, allspice, cloves, etc.) were produced in considerable quantity, and their production seemed well established. A lack of technical knowledge of the industries, coupled with special concessions granted to the city and merchants of Acapulco, Mexico, and those assumed by various provincial governors down to 1844, served to nullify all the projects of the company, causing its final downfall. A number of enterprises that were begun under the stimulus of this bounty have since retrograded, until now they are of comparatively little importance. Notably true is this of the production of rubber, indigo, cotton, silk, and condiments. Among the natives the present status of agriculture seems to be limited to the production of a few food stuffs, and these, with fruits which can be obtained from the forest, supply the necessities of life, while manila hemp is resorted to to provide ready cash whenever any is needed. There is always a market for this fiber, and it is purchased in any amount, a few pounds being easily brought to market, and the purchase price supplying the temporary requirements of the seller.

On November 15, 1881, there was organized as a sort of adjunct to the department of forest inspection an agricultural society, but the two were separated after an existence of about three years. On July 8, 1884, it was decreed that "in the future the agricultural department should be independent of the inspector-general of state lands, and should remain in charge of an agricultural commission, whose organization, object, functions, and duties were determined in regulations approved by the sovereign." These regulations required a study of agriculture, animal production, and the means leading to their improvement, theoretical and practical teaching of agriculture and animal culture, the preparation of reports relating to the above, editing of monographs with reference to the agriculture of the archipelago, and the making of agricultural and other collections for local museums. A royal decree issued November 26, 1887, established a school of agriculture at Manila, and in 1888 the budget, as given by Foreman in his work on the Philippine Islands, provided $113,686.64 for the support of this school and model farms which had been established in different provinces about this same time. According to the decree establishing a school of agriculture, attention was to be given to,

"first, the determination and study of the physical properties of the tillable soils of the region; second, mechanical analysis of the same; third, physical-chemical analysis of the same; fourth, qualitative analysis of the same; fifth, analyses and experiments by the scholars and their employment in actual practice; sixth, study of systems of irrigation, quantity and quality of water, epochs and times of irrigation best adapted to cultivation; seventh, analysis and study of seeds, methods of sowing and grafting; eighth, study and analysis of secondary products of agricultural products and their uses; ninth, experiments with classes of labor, and with machines and instruments best adapted to cultivation; tenth, experiments with new kinds of products, and studies of their adaptability and cultivation; eleventh, study of the climate and its action upon products, of the natural fertility of the soil, the assimilation of atmospheric and other elements, and the manner of changing them; twelfth, study of the expense and products of actual cultivation and of reforms in the economy of production; thirteenth, studies with reference to herds and their races, qualities, feeding, care, and the acclimatization of new species and breeds; fourteenth, study of agricultural industry, industrial products, machinery, and reforms in industrial methods; fifteenth, study of the diseases or pests affecting crops and animals and the means of combating them and conserving products; sixteenth, solution of all other problems of technical or economical character which affect, or may affect, the agriculture of the region."

In addition to the above, agricultural instruction was given in the University of Manila and at the Municipal Atheneum. The laws under which they were conducted required that the directors and professors of the schools and farms should be agricultural engineers, with skilled graduated farmers for their assistants. In 1887 the first model farm in this system was established at La Carlota, near the principal center of agricultural activity of the archipelago. A little later a second was established at San Pedro de Magalang, Luzon. After 1888 this station paid especial attention to horse breeding, a stud of Arabian horses being maintained for crossing with the smaller horses of the islands. Other stations were maintained at Albay, Isabela Luzon, Iloilo, Ilocos Sur, and at Cebu. Stations were also established at Jolo and Leyte, but were discontinued September 10, 1888, and December 7, 1891. These stations were designed to show what cultures could be successfully maintained in their vicinity, and received a limited number of students, who were trained as overseers for large plantations. Since January, 1894, there has been published an official journal entitled Boletin Oficial Agricola de Filipinas. It was designed to give accounts and to place on record the various investigations undertaken at the agricultural schools and stations. A few numbers of this bulletin have been received at the Library of this Department, but they give little data regarding the work done, the principal articles being reprints or reports of agriculture in other countries. Since the American occupation of the Philippines but little appears to have been done in the maintenance of these schools and stations. At least, the available information regarding education does not mention at all, or but briefly, the subject of agricultural instruction in the islands. That the Philippine Commission is alive to the necessity of the subject is shown by the fact that it has established a bureau of forestry, which is placed in charge of a competent officer with a corps of assistants, and examinations have been held by the United States Civil Service Commission to supply a register for instructors in agriculture and some of its allied branches. The necessity for the introduction of modern methods of cultivating and handling crops is apparent to anyone who reads any of the numerous publications which treat at all fully of the conditions existing in the islands. But little stimulus would be required to restore many of the almost abandoned industries to a state in which they would be remunerative, and the possibilities of extending the cultivation of such crops as rice, sugar, coffee, and tobacco seem to be almost unlimited, if the reports at hand are to be believed.

It would, in my judgment, be best to confine the preliminary investigation in the Philippines within the area of the islands controlled by the civil government, and to limit it to such studies as are necessary to determine the most suitable location for an experiment station which could at once take up a few lines of work of the most pressing importance. With headquarters for agricultural investigations once established, and a single experiment station well organized, it would be easy to extend the work of agricultural research so that it would take into account the special needs of different localities. I therefore recommend that an initial appropriation of $15,000 be made to enable the Secretary of Agriculture to institute agricul-

tural investigations in the Philippines and to locate and maintain an agricultural experiment station there. In order that these investigations may be begun at an early day, one-third of this amount should be made immediately available.

Nutrition Investigations.

The investigations on the food and nutrition of man, carried on in different parts of the country, have been continued during the past year, with Prof. W. O. Atwater as special agent in charge. The headquarters for these investigations have remained at Middletown, Conn., where the work is carried on in cooperation with Wesleyan University and the Storrs Experiment Station.

As in previous years, the work is done largely in connection with the experiment stations, colleges, and universities, some of the leading institutions in the country being represented among the cooperators. This policy secures the services of skilled investigators, utilizes the resources of the institutions, secures an amount of valuable research very large in proportion to the cost, awakens widespread interest, and helps to give large and useful publicity to the results.

Following is a list of the cooperators during the year, and of the institutions with which they are connected:

Maine: State University and Experiment Station, Prof. C. D. Woods and associates.
Massachusetts: Harvard University, Dr. E. A. Darling, Mr. Edward Mallinckrodt, jr.
Connecticut: Wesleyan University and Storrs Experiment Station, Prof. W. O. Atwater and associates.
New York: Columbia University, Dr. H. C. Sherman.
Tennessee: State University, Prof. C. E. Wait and associates.
Illinois: State University, Prof. H. S. Grindley.
Minnesota: State University and Agricultural College, Prof. Harry Snyder.
California: State University and Experiment Station, Prof. M. E. Jaffa.

The publications of the year have also included work of the following: North Dakota—State Agricultural College, E. F. Ladd; Ohio—Lake Erie College, Miss Isabel Bevier.

General Purpose and Plan of the Investigations.

The nutrition investigations the past year may be divided into four general classes: (1) Dietary studies; (2) digestion experiments; (3) cooking experiments; (4) metabolism experiments.

The dietary studies have been conducted in various parts of the United States, and have included the study of the diet of people of varying ages and occupations under different conditions. They furnish a considerable amount of data as to the actual food habits of persons in different parts of the country, give opportunity for comparison with the data obtained in other countries, and aid in establishing a general nutrition standard.

The digestion experiments have also been conducted in different parts of the country under widely varying conditions. By means of these experiments the digestibility of various classes of food materials, like meats, cereals, legumes, fruits, nuts, etc., is studied and data are obtained as to the amount of the food material consumed which is made available for use in the human body.

The cooking experiments have been made with meat, and have included the study of the effects of different methods of cooking upon

the meat with reference to composition, digestibility, nutritive value, and pecuniary economy.

The metabolism experiments have been conducted mostly at Middletown, with the aid of the respiration calorimeter. In these experiments the income and outgo of the body were carefully observed under different conditions of rest and work. The questions especially considered this year were (1) the relation between muscular work and the metabolism of nitrogen, and (2) the relative efficiency of fats and carbohydrates in the diet for severe muscular work. The results obtained have been unusually interesting and valuable.

All these experiments include a large amount of analytical work as well as the determination of a considerable number of heats of combustion by means of the bomb calorimeter.

Considerable editorial work is also required to put the results of the investigations in form for publication as either technical or popular bulletins. The amount of editorial work has been somewhat larger this year than usual.

THE WORK AT DIFFERENT PLACES.

The work of the Washington office in relation to the nutrition investigations during the past year has included a general supervision of the plans and expenditures; editorial work in perfecting the details of reports of investigations; collection of bibliographical data; the abstracting of the literature of nutrition, partly for publication in the Experiment Station Record; the conducting of a large correspondence growing out of the nutrition investigations, and the distribution of publications on this subject.

The work of the office of the special agent in charge of the nutrition investigations at Middletown, Conn., has included the planning and direct supervision of these investigations in different parts of the country, the conducting of special investigations with the respiration calorimeter and bomb calorimeter, the compilation of the results of nutrition investigations in this country and abroad, and a large correspondence relating to these investigations. The special investigations carried on here the past year in cooperation with Wesleyan University and the Storrs Experiment Station have included an unusually large amount of experimental work with the respiration calorimeter. The principal objects of these investigations were to study the relation between muscular work and the relative efficiency of fats and carbohydrates in the diet for severe muscular work. Other observations made were of the amount of heat liberated by the body during the period of digestive inactivity as compared with the period when digestion is going on, the metabolism of nitrogen during fasting, and variation of body temperature under different conditions. Four series of experiments, covering a period of nine days each, and a shorter series of five days, were conducted during the year. With but one exception, each series included three experiments—two of four days each, followed by one of one day. During the first two experiments of the longer series the subject performed severe muscular labor, riding a stationary bicycle eight hours in the day. In one of the experiments a diet rich in carbohydrates was given to the subject, while in the other a diet rich in fats was provided, the amounts of protein and energy being essentially the same, as well as the amount and character of the work. Two pairs of experiments were followed by an experimental day of rest and fasting. Two other pairs were followed

by an experimental day in which the diet was changed, while the amount and character of the work remained the same. The short series included one experiment of four days, in which the subject did not work, followed by an experimental day of rest and fasting. The measurements of outgo of carbon, hydrogen, and energy were made in two-hour periods, and the results will serve to show the relation of elimination of these to the character and amount of work done. The three fasting experiments throw some light upon the amount of energy required for digestion. The general results of the experiments are of unusual interest and importance. They attest the validity of the statement previously made that these experiments go a long way toward proving the application of the law of the conservation of energy in the living organism, if they may not be taken as practically proving it. The results also appear to show a very slight difference in the value of fat and sugar as a source of energy for muscular work in favor of the sugar.

In connection with this experimental work, 16 digestion experiments have been made, 67 complete and 407 partial analyses of food and excretory products were made, together with over 100 determinations of heats of combustion of food materials and excretory products, by use of the bomb calorimeter.

Some new apparatus has been devised and changes and improvements adopted which give increased efficiency. By means of a specially devised thermometer for determining the internal body temperatures, which has been in use the past year, temperature observations have been secured which will constitute an important addition to the value of the work done.

At the request of the acting superintendent of the Elmira Reformatory, Elmira, N. Y., a study was made by some of our assistants in Middletown of the dietaries of the inmates of that institution. This study, while necessarily very limited in scope, gave results of some value, and was of special interest as showing the possibilities for such work and the need of investigation along this line.

Under direction from Middletown, a study was made last year of the dietaries of ten students at Harvard College by Mr. Edward Mallinckrodt, jr., with the cooperation of Professor Sanger. Some of these students are obliged to live very economically and their food consumption was quite limited. The studies were carried on during three periods of three weeks each, one in the late fall, one in winter, and one in late spring. Records of the physical condition of the subjects were made during each experimental period. The data of the investigation will, it is expected, serve as a valuable contribution to the subject of the food consumption of sedentary persons. The dietary and digestion experiments with members of the Harvard boat crews at New London, begun last year, and carried out with the cooperation of Dr. E. A. Darling, have been completed.

Besides the investigations for this Department, several other lines of nutrition investigations are carried on at Middletown under Professor Atwater's supervision.

The experiments referred to in my last report as being conducted under the auspices of the committee of fifty for the investigation of the drink problem have been completed. While this work is entirely independent of the Department of Agriculture, still the material thus gained will prove of much value in connection with the general nutrition investigations. Indeed, the main results of the experiments are independent of those relating to the action of alcohol. The investi-

gations also referred to in my last report as being carried on by authority of the New York State commission in lunacy, for the purpose of establishing a standard dietary for use in the hospitals for the insane in the State of New York, have been continued during the past year. A number of dietary studies have been made in the New York hospitals. Much attention has been directed to preparing the results of the investigations for practical use and publication. These results, also, will prove a useful contribution to the knowledge already gained of the general subject of the nutrition of man. The investigations have attracted considerable attention, especially among those interested in sociological and economic questions, and may lead to broader and more extended investigations along these lines.

In Maine, Prof. C. D. Woods, at the University of Maine, Orono, has been comparing the digestibility of breads made from Northwestern wheat milled in different ways. This was a repetition of the experiments conducted the previous year in order to verify and substantiate the results then obtained. Straight patent, so-called entire wheat, and graham flours were used, and nine digestion experiments, with three subjects, were made. Three experiments were conducted with each subject with the different flours, and included considerable analytical work. Considerable work has also been done with Maine wheats milled in different ways. In addition, two digestion experiments were made with chestnuts, and a long series of studies were carried out with different materials as markers, for the purpose of perfecting a method for obtaining more accurate results in digestion experiments. The work on the different kinds of flour is of great practical importance and has added much to the knowledge of the relative digestibility of the nutrients of these three flours, a subject which has been much discussed.

In Minnesota, Prof. Harry Snyder, of the Agricultural College of the University of Minnesota, St. Anthony Park, has been cooperating with Professor Woods in the experiments with flour. The opportunity for work of this kind in that section is especially favorable, since it is in the center of the milling district of the Northwest, and most fortunately some of the great milling establishments, finding the inquiry of decided practical value, have offered unusual facilities for experiments upon the milling products and bread made from them. Nine digestion experiments with three different subjects have been made with straight patent, so-called entire wheat, and graham flours. These flours were all milled from the same lot of wheat and were duplicate samples of those used by Professor Woods, and the experiments were parallel in every respect.

In Illinois, Prof. H. S. Grindley, of the University of Illinois, Champaign, has continued his investigations on the digestibility of meats, as determined by natural and artificial digestion experiments, and the losses involved in different methods of cooking various kinds of meat. These were in continuation of the investigations conducted the two previous years, a report of which is soon to be published. Fifteen cooking experiments were made, in which the results obtained in frying and boiling were compared, beef being the meat generally used. The experiments included the analysis of a considerable number of cooked meats, clear broth, and the coarse and fine residues obtained from meat broths. Thirteen natural digestion experiments with men were also made, in which meat formed a large part of the diet. These experiments included a large amount of analytical work with food and feces and the determination of the nitrogenous material in several

samples of feces soluble in pepsin solution. Considerable work was also done upon the artificial digestion of meats, this, however, being largely preliminary to work to be done later. In addition, the heats of combustion of fifty samples of foods and excretory products in duplicate were determined. Finally, an inquiry has been undertaken regarding the so-called extractives in meat.

In Tennessee, Prof. C. E. Wait, of the University of Tennessee, Knoxville, has been investigating the dietary of poor whites in eastern Tennessee and the digestibility and availability of the nutrients of legumes. Six dietary studies were made with typical families of white people of limited means, and interesting results were obtained. For the experiments on the digestibility of legumes, beans were selected, and eight digestion experiments were made, including one metabolism experiment. These were not less than four days in duration, and were made for the purpose of determining not only the digestibility and availability of the nutrients of the legumes, but also the effect of rations of wide nutritive ratio as well as those of rather narrow nutritive ratio upon the digestibility of protein and the metabolism of nitrogen.

In California, Prof. M. E. Jaffa, at the University of California, Berkeley, has been making special investigations as to the food value of fruits. Nine dietary studies were made and one digestion experiment, which also included a metabolism experiment. The subjects of the experiments were five fruitarians, two women and three children, whose diet had been for a long time almost wholly composed of fruits and nuts. They appeared to be in excellent health, and claimed to be better than when they lived upon a mixed diet. The food was all eaten raw, and the total quantity of nutrients was very small in comparison with ordinary dietary standards. The digestibility of the diet appeared to be as great as that of an ordinary mixed diet.

FOOD AND NUTRITION PUBLICATIONS.

Seven technical bulletins, two Farmers' Bulletins, a Yearbook article, and two circulars on subjects relating to the food and nutrition of man were prepared for the press during the past year, making in the aggregate 450 to 500 pages of printed matter on this subject.

Nutrition Investigations at the California Agricultural Experiment Station, 1896–1898, by M. E. Jaffa, assistant professor of agriculture, University of California (Bulletin No. 84, pp. 39), reports four dietary studies of infants, one of the university football team during training, and one of a chemist's family; also digestion experiments with an infant on a milk diet, as well as a metabolism experiment in which the balance of income and outgo of nitrogen was determined.

A Report of Investigations on the Digestibility and Nutritive Value of Bread, by Charles D. Woods, director, and L. H. Merrill, chemist, Maine Agricultural Experiment Station (Bulletin No. 85, pp. 51). This bulletin is a progress report, giving the results of experiments with men on the digestibility of bread of various kinds when eaten alone and when forming a part of a simple mixed diet; artificial digestion experiments with the same sorts of bread; a test of skim milk *v.* water for use in mixing dough; and studies of the loss of nutrients in bread making and of methods of determining metabolic nitrogen.

Experiments on the Effect of Muscular Work upon the Digestibility of Food and the Metabolism of Nitrogen, conducted at the University

of Tennessee, 1897–1899, by Charles E. Wait, professor of chemistry, University of Tennessee (Bulletin No. 89, pp. 77), is a report on 16 experiments with men, undertaken for the purpose of studying the effect of muscular work upon the digestibility of a simple mixed diet and upon the metabolism of nitrogen, with numerous analyses of the food materials used in the experiments.

Nutrition Investigations at the University of Illinois, North Dakota Agricultural College, and Lake Erie College, Ohio, 1896 to 1900, by H. S. Grindley and J. L. Sammis, E. F. Ladd, and Isabel Bevier, and Elizabeth C. Sprague (Bulletin No. 91, pp. 42), reports the results of a study of the diet of a teacher's family and of a mechanics' boarding club at the University of Illinois, Champaign, Ill.; of a club of women students at the North Dakota Agricultural College, Fargo, N. Dak.; and of the faculty and students at the college commons of Lake Erie College, Painesville, Ohio, including numerous analyses of the food materials used.

The Effect of Severe and Prolonged Muscular Work on Food Consumption, Digestion, and Metabolism, by W. O. Atwater and H. C. Sherman, and the Mechanical Work and Efficiency of Bicyclers, by R. C. Carpenter (Bulletin No. 98, pp. 67, figs. 3), reviews previous investigations on this subject, and reports studies of the food consumption, digestion, and metabolism of three of the contestants in a six-day bicycle race at Madison Square Garden, New York, with a critical discussion, by the professor of experimental engineering of Cornell University, of the mechanical work and efficiency of bicyclers based upon data secured in these studies.

Beans, Peas, and Other Legumes as Food, by Mary Hinman Abel (Farmers' Bulletin No. 121, pp. 32, figs. 10). For note on this bulletin see page 200.

Eggs and Their Uses as Food, by C. F. Langworthy (Farmers' Bulletin No. 128, pp. 32). This bulletin is noted on page 200.

The Value of Potatoes as Food (Yearbook of the Department of Agriculture, 1900, pp. 337–348), by C. F. Langworthy, summarizes the available information on this subject.

There were also prepared and submitted for publication the following bulletins:

Studies on Bread and Bread Making, by H. Snyder, professor of chemistry, College of Agriculture, University of Minnesota, and chemist of the agricultural experiment station (Bulletin No. 101, pp. 65, pls. 3, fig. 1).

Experiments on the Losses Involved in the Cooking of Meat, 1898–1899, by H. S. Grindley, professor of chemistry, College of Agriculture, University of Illinois, with the cooperation of H. McCormick and H. C. Porter, of the department of chemistry of the university (Bulletin No. 102, pp. 64).

PLANS FOR NEW NUTRITION WORK.

During the present fiscal year the nutrition investigations will proceed along the same general lines as heretofore, but will be somewhat increased in amount and variety. A special effort will be made to put in form for publication a large amount of the material which has accumulated from various sources. At Middletown the experiments with the respiration calorimeter and bomb calorimeter will be continued. Plans are being made to add to the respiration calorimeter special devices for the direct determination of oxygen. It is also

planned to make investigations along this line with the smaller Rosenthal calorimeter. In Maine and Minnesota the studies on cereals will be continued. In the former, State plans are being made for dietary studies in logging camps, the conditions for such studies being especially favorable at this time. The work performed at these camps is very arduous, often covering from fifteen to eighteen hours per day of hard labor under severe conditions of cold and wet. Dietary studies under these circumstances will doubtless add much valuable information regarding the food requirements of men laboring under severe conditions. In Tennessee it is proposed to continue the digestion experiments with different legumes and to enlarge the number of dietary studies among the small farmers of that State. In Illinois the study of meats will be continued in the same lines as heretofore. Special attention will be given to the experiments on the effects of different methods of cooking on the nutritive value and digestibility of meats. The facilities offered for this work at the University of Illinois have been much improved and the funds allotted by this Department for this investigation have been increased. In California the investigations on the dietetic value of fruits will be continued on a larger scale than previously, including both dietary studies and digestion experiments. The studies already conducted have aroused much local interest in California, and the University of California is cooperating heartily in this work. In Vermont the investigations in cooperation with the State University, proposed for last year but unavoidably postponed, will be conducted on a larger scale than originally planned. They will include especially the study of farmers' dietaries, with particular reference to the place of milk and dairy products in the diet. In New York, at Columbia University, a study of sulphur and phosphorus metabolism has been undertaken. This will include digestion experiments in which the income and outgo of nitrogen, sulphur, and phosphorus will be determined, and the "balance" of these elements compared. This is a new feature in these investigations.

FURTHER OPPORTUNITIES FOR NUTRITION INVESTIGATIONS.

The evidences of popular and scientific interest in the nutrition investigations of this Department continue to multiply. Scientific publications at home and abroad refer to these investigations more and more frequently and with increasing approval. The results of these investigations are being incorporated in other investigations and in scientific works on this subject, and the apparatus and methods devised by our investigators are being adopted both at home and abroad. There is a constantly increasing demand for popular and technical publications and an enlarged correspondence. Our publications are being used to an unusual extent in connection with the courses of instruction in domestic science in schools of all grades in this and other countries, and are also much sought after by women's organizations interested in the promotion of home economics and by physicians.

The lines and methods of investigation have now been so well worked out that it is believed the time has come for the wider extension of these investigations in certain directions. While a considerable number of dietary studies have been made, these have by no means covered the variety of conditions existing in different parts of this country and among people of different occupations. A more systematic and thorough attempt should be made to collect reliable data regarding the food habits of our people. We need, for example,

to study the food consumption of our farmers and rural and urban wage-workers in different regions with special reference to their hygienic and economic requirements.

It is believed that the results of nutrition investigations already made may be practically and beneficially applied in a wide way to the feeding of men wherever a considerable number of persons are to be fed on a systematic plan. This applies especially to boarding schools, college clubs, reformatory and penal institutions, hospitals for the insane and other dependent classes, and the Army and Navy. A beginning has already been made in this direction, but there is still room for a large amount of investigation before definite suggestions of general application can be made. The importance of this subject may be illustrated by reference to the hospitals for the insane in the State of New York, in which the special agent in charge of our investigations has already made some studies under State auspices. The annual cost of the food supply to these hospitals has been over $1,000,000. The investigations already made show that not only may the total cost be considerably reduced and large wastes prevented, but that the dietaries of the inmates of these institutions may be much improved by attention to the facts and principles established by nutrition investigations. These preliminary investigations have also shown the need for more accurate inquiries regarding the food requirements of different classes of persons in these institutions. In the State of New York alone not far from 100,000 people of the dependent and delinquent classes are maintained in public institutions at an annual expense of $26,000,000, of which about $6,000,000 is expended for food. This will give some indication of the vast interests at stake in this matter when we take the whole country into account. Certainly here is a field of investigation upon which the Department might well enter, and in which results of great practical value might be expected.

For the extension of the nutrition investigations in the two lines above mentioned, namely, (1) dietary studies of farmers and rural and urban wage workers, and (2) studies with reference to the utilization of the results of nutrition investigations in public institutions, I recommend that $5,000 be added to the present appropriation for nutrition investigations.

In my report for last year I called attention to the fact that investigations were needed to determine the food habits and requirements of people living in tropical countries. This matter is evidently becoming of increasing importance to our people. The continuance of soldiers, sailors, and civil officers of the United States in such regions would of itself justify the institution of investigations to determine the best dietaries for their use while there. With our rapidly expanding commerce and the going out of considerable numbers of our people to reside in tropical regions, there is additional reason for undertaking such studies. Moreover, we need to study the dietaries of the native populations which have recently come under the jurisdiction of the United States, with a view to determining the relation of their food habits to their health and industrial efficiency. Such investigations may easily become an important factor in the agriculture, trade, and commerce of these regions, as well as in the formulation of plans for the improvement of the conditions of life among these peoples. Therefore I recommend that an appropriation of $5,000 be asked for to enable this Department to undertake studies of the food supply and consumption of people living in the Tropics.

Irrigation Investigations.

The irrigation investigations conducted under the direction of this Office have pursued the same general lines as heretofore, the work having been extended to meet the growing demand for information on this subject as far as the appropriation of $50,000 would permit. The field office at Cheyenne has been maintained and investigations conducted from that point, the Office at Washington attending to the business which must necessarily be performed in the Department connected with the supervision of expenditures, the purchase of apparatus and supplies, the preparation of bulletins and reports for publication, and the distribution of these publications. As heretofore, the irrigation investigations have been in charge of Prof. Elwood Mead.

COOPERATION WITH OTHER AGENCIES.

As far as practicable arrangements have been made to cooperate with other agencies engaged in the study of irrigation questions. These cooperative efforts include the agricultural colleges and experiment stations of California, Washington, Montana, Idaho, Nevada, Utah, Wyoming, Nebraska, Texas, Arizona, and New Mexico in the arid region, and Wisconsin, Missouri, North Dakota, and New Jersey in the humid region. The different State irrigation offices are also being aided in the study of questions for which the States do not provide sufficient means. The cooperation with the State engineers' offices includes Nebraska, Colorado, Wyoming, Utah, and Idaho, all of the arid States in which such offices have been established.

IRRIGATION LAWS.

In accordance with the terms of the act creating this investigation, it has been continued to follow two distinct lines, (1) the study of laws and institutions of the different States relating to the ownership and distribution of the public water supplies, and (2) to assist the irrigators under ditches already built and the managers of the canals which supply the farms now irrigated in the improvement of methods of distributing and using water in order that the land now cultivated by irrigation may be rendered more valuable, the controversies over water rights lessened, and its economical use promoted.

Under the first division the investigation began by a study of the laws and customs governing the ownership and use of a single stream. It has been found desirable to modify this plan by taking up in turn the laws governing rights to water in a single State, as in this way the people of that State can better understand the merits and defects of the irrigation laws now in force and the measures necessary to avert the evils which have arisen under these laws or to promote development by their modification. The report on irrigation in California (see p. 230) is the first of these special studies of State laws. The reports of the eight experts engaged in this investigation give the most exhaustive description of irrigation conditions yet published of any State. In addition, it contains a general review of the agricultural situation and possibilities of California, written by the expert in charge, based on his personal studies. A similar investigation is now being carried on in Utah. It will include a report on Weber River by Prof. J. D. Stannard, assistant in irrigation investigations; on

Spanish Fork River by Hon. A. P. Doremus, State engineer of Utah; on the watershed of Utah Lake by A. P. Stover, assistant in irrigation investigations; on Jordan River by R. P. Teele, assistant in irrigation investigations, and an introductory review of irrigation in Utah by William E. Smythe. The increasing utilization of streams for power purposes and for the domestic supply of cities and towns, added to the greater needs of irrigation, makes the securing of some simpler and cheaper method of settling titles to water and the inauguration of a more effective system for protecting rights in times of scarcity an indispensable necessity. Hence, the results of these investigations are being awaited by irrigators with deep interest.

The studies of the operation of the Colorado laws have been continued under the direction of Hon. A. J. McCune, State engineer. The publication of his report has been delayed in order to permit of his availing himself of another season's observation of the operation of these laws. It will be published as soon as the results of this year's investigations have been completed.

THE DUTY OF WATER.

The measurements of the water used in irrigation for the past season embraced a much wider area, a better equipment, and more satisfactory results than those of the previous year. Enough time has not yet elapsed to formulate any final conclusions regarding the duty of water, but these studies have already shown the value of the information gained as a basis for the planning of the larger and costlier works which must be built in the future, a guide for the operation of canals when built and the framing of contracts for supplying water to users and for enabling the public authorities to properly supervise and control the division of streams. The location of the stations and the names of the observers in charge of the studies of water duties are given in the following table:

Official stations and names of observers.

State.	Location.	Observer.
California	Santa Ana River	W. Irving, chief engineer Gage Canal.
California	Tule River	Prof. J. M. Wilson,[1] assistant professor of irrigation, University of California, Berkeley.
	Cache Creek	Do.[1]
Washington	Yakima River	Prof. O. L. Waller, professor civil engineering, Washington Agricultural College and School of Science, Pullman.
	Columbia River	Do.
Nevada	Humboldt River	Prof. J. D. Stannard, assistant in irrigation investigations.
	Truckee River	Do.
Arizona	Salt River	W. H. Code, chief engineer Consolidated Canal, Mesa.
	Salt River	Prof. A. J. McClatchie, Arizona Experiment Station, Phoenix.
New Mexico	Pecos and Rio Grande rivers	W. M. Reed, civil engineer, Roswell.
Texas	Colorado, Brazos, and Wichita rivers.	Prof. J. C. Nagle, professor of civil engineering, Texas Agricultural College, College Station.
Colorado	Arkansas and Grand rivers.	A. P. Stover, assistant in irrigation investigations.
	Big Thompson River	Hon. A. J. McCune, State engineer, Denver.

[1] Professor Wilson has had associated with him in these investigations A. E. Chandler, instructor in civil engineering, University of California. Prof. E. W. Hilgard, director of the agricultural experiment station, University of California, has conducted an independent investigation having special reference to the utilization of the water supplies of California.

Official stations and names of observers—Continued.

State.	Location.	Observer.
Utah	Tributaries of the Jordan River.	Hon. R. C. Gemmell, ex-State engineer, Salt Lake City.
	Spanish Fork River	Hon. A. P. Doremus, State engineer, Salt Lake City.
	Logan River	Prof. George L. Swendsen, professor of civil engineering, Utah Agricultural College, Logan.
Montana	Bozeman and Bitterroot rivers.	S. Fortier, director agricultural experiment station, Montana Agricultural College, Bozeman.
Wyoming	Laramie River	Eldon T. Johnston, Wheatland.
Nebraska	Loup and North Platte rivers.	O. V. P. Stout, professor of engineering, University of Nebraska, Lincoln.
Wisconsin	Stevens Point	Prof. F. H. King, professor of agricultural physics, College of Agriculture, University of Wisconsin, Madison.
Missouri	Columbia	Prof. H. J. Waters, director agricultural experiment station, University of Missouri, Columbia.
New Jersey	New Brunswick and Vineland.	Prof. E. B. Voorhees, director New Jersey agricultural experiment stations, New Brunswick.
Louisiana	Rice irrigation along Gulf coast.	Frank Bond, assistant in irrigation investigations.
South Atlantic coast	Rice irrigation	George H. Keeney, assistant in irrigation investigations.
North Dakota	Fargo	Prof. E. F. Ladd, North Dakota Agricultural College, Fargo.

DESIGNING OF INSTRUMENTS FOR MEASURING AND RECORDING FLOW OF WATER.

The designing of instruments for measuring and recording the water used in irrigation begun by Professor Mead has continued under his direction. Two new designs for water registers were furnished to irrigators and canal companies last year. The latest of these designs can be furnished irrigators at about one-half the cost of the foreign instruments formerly used, and one instrument maker in Denver has engaged in their manufacture extensively. The first step toward economy in the use of water is to enable farmers to know whether they are receiving what they are paying for, and to insure to canal companies an accurate record of what they deliver. Since the ultimate extent of the cultivated area will be measured by the water supply rather than the area of irrigable land, the efforts to increase its duty have a direct relation to both the value of irrigation work and the ultimate area of cultivated land.

DISTRIBUTION OF WATER FROM STREAMS.

Better facilities for observation and more capable observers have permitted an extension of the studies of the duty of water so as to embrace an entire stream. Those in charge of the division of rivers know that much of the water diverted returns again; that in some places the flow of the stream sinks in the sand to again reappear on the surface lower down. Each stream has therefore problems of its own, and its behavior, as irrigation extends, must be studied and understood in order that the largest and best use of its waters may be made. Experience has shown that not only is the land along one portion of a stream much more valuable than another portion, but that its waters can be made to irrigate a much larger area in favorable sections than if unfavorable ones are chosen. The area which a

stream will irrigate in certain sections of its course can be doubled or trebled in more favorable sections. As an illustration, it may be stated that during the past season, while Snake River, Idaho, was dry at one point in its channel, at a point 40 miles below it contained over 2,000 cubic feet per second. The percentage of the volume of water used which returns to the channel of the stream helps to measure the ultimate duty of water, and in order to ascertain this, studies were inaugurated the past season to keep a record of the volume diverted by the different canals along an entire river, the volume of the original flow, and the total volume which seepage and percolation permitted to be used. These studies will not only answer the question of how much land the stream can irrigate, but will show the locations where water can be best diverted. The most extensive of these studies is being carried on in Nevada under the direction of Prof. J. D. Stannard. The next most extensive is in California under the direction of Prof. J. M. Wilson. Hon. D. W. Ross, State engineer of Idaho, has begun a similar study in Idaho, and A. P. Stover is making a special study of the same subject in Colorado and Utah.

COEFFICIENT OF FRICTION.

This investigation has also secured the interest and cooperation of a large number of irrigation engineers and managers of canal companies in a series of measurements to determine the coefficient of friction in canals and laterals, especially the latter, data for the accurate determination of the flow of small ditches being very much needed.

IRRIGATION IN THE HUMID PORTIONS OF THE UNITED STATES.

During the past two years more miles of irrigation canal have been built and more money expended for pumping plants to furnish water for irrigation in the State of Louisiana than in any of the arid States. The application of irrigation to growing rice has raised the value of large areas of land from $5 and $10 an acre to $50 or $100 an acre, and promises to make the United States an exporting instead of an importing country so far as this product is concerned. At the request of those interested, Mr. Frank Bond, irrigation expert, has been detailed to aid in the solution of the problems created by this new form of agriculture along the Gulf coast, and Mr. George H. Keeney is making similar investigations along the Atlantic seaboard. In the Mississippi Valley provision for the experimental use of water in irrigation was begun in 1900 in Wisconsin under the direction of Prof. F. H. King, and in Missouri under the direction of Prof. H. J. Waters. The work in New Jersey, inaugurated the year previous, has been continued. The severe drought of 1901 has given a more than local interest to these efforts to provide a water supply, whenever needed, for the lands of the humid States. The director of the Missouri experiment station states that their irrigation experiments are being watched by the farmers of that State with more interest than any work previously attempted by that station.

SEDIMENT INVESTIGATIONS.

The studies of the amount and character of the sediment carried by streams used in irrigation and its influence, beneficial or otherwise, on the land where applied, have been continued under the direction of Prof. J. C. Nagle, of the Texas Agricultural College. It has been

found necessary to devise special apparatus for securing samples, and this has been done under the direction of the expert in charge. The important influence of sediment is shown in the fact that as high as 34 per cent of solid matter was contained in some of the samples taken. The effects of this on the continuous operation of canals or on the enduring value of storage basins are so marked as to warrant the continuance of these studies, which has been arranged for.

IRRIGATION PUBLICATIONS.

Six technical bulletins, one Farmers' Bulletin, a Yearbook article, and a circular on irrigation, aggregating over 1,500 printed pages, have been prepared for publication during the year.

The Use of Water in Irrigation. Report of Investigations made in 1899, under the supervision of Elwood Mead, expert in charge, and C. T. Johnston, assistant, including reports by special agents and observers W. M. Reed, W. H. Code, W. Irving, O. V. P. Stout, Thomas Berry, S. Fortier, R. C. Gemmell, G. L. Swendsen, and D. W. Ross (Bulletin No. 86, pp. 253, pls. 50, figs. 18). This bulletin explains the methods in use in the arid States in the distribution and use of water in irrigation. It gives a large number of measurements made to determine the duty of water and the losses by seepage and evaporation from canals, and discusses the methods by which the water supply may be more effectively and economically utilized in the production of crops.

Irrigation in New Jersey, by Edward B. Voorhees, director, New Jersey Agricultural Experiment Stations and professor of agriculture, Rutgers College (Bulletin No. 87, pp. 40, figs. 5), gives the results of a number of experiments on different kinds of small fruits, melons, and vegetables during 1898 and 1899, made for the purpose of determining whether irrigation during short periods of drought in regions where the rainfall is usually sufficient for the maximum growth of crops will sufficiently increase the yield to pay for the works necessary to obtain the supply of water, and reports observations on the construction and cost of six small irrigation plants in New Jersey.

Irrigation in Hawaii, by Walter Maxwell, director and chief chemist, Hawaiian Experiment Station (Bulletin No. 90, pp. 48, pls. 6, figs. 3), discusses the climatic soil and other conditions as affecting irrigation in Hawaii, and gives the results of irrigation experiments, especially with sugar cane, carried on by the author for a number of years.

The Reservoir System of the Cache la Poudre Valley, by E. S. Nettleton (Bulletin No. 92, pp. 48, pls. 14), contains a description of the reservoir system of the Cache la Poudre Valley, showing the benefits to be derived from the construction of reservoirs for the storage of water for irrigation.

Irrigation Laws of the Northwest Territories of Canada and Wyoming, with discussions by J. S. Dennis, deputy commissioner of public works, Canada, and Fred Bond, State engineer of Wyoming, and J. M. Wilson, agent and expert, irrigation investigations, Office of Experiment Stations (Bulletin No. 96, pp. 90, pls. 5), includes texts of the irrigation laws of the northwest territories of Canada and of Wyoming, with the regulations, forms, and methods of procedure adopted in the administration of these laws, and discussion of the principles underlying the laws and the methods followed in their enforcement.

Irrigation Investigations in California, by Elwood Mead and others (Senate Doc. No. 108, Fifty-sixth Congress, 2d session, pp. 73). This

is an abridged preliminary report on investigations reported in full in Bulletin No. 100, noted below, prepared in response to a Senate resolution.

Practical Irrigation (Yearbook of the Department of Agriculture, 1900, pp. 491–512, figs. 9), by C. T. Johnston and J. D. Stannard, gives simple directions for the use of the individual farmer.

There were also prepared and submitted for publication the following:

Report on Irrigation Investigations in California, under the supervision of Elwood Mead, assisted by Wm. E. Smythe, Marsden Manson, J. M. Wilson, Chas. D. Marx, Frank Soulé, C. E. Grunsky, Edward M. Boggs, and James D. Schuyler (Bulletin No. 100, pp. 411, pls. 29, figs. 16), which gives an account of investigations conducted in California during 1900 by this Office, cooperating with the California Water and Forest Association, which consisted of observations by irrigation experts on the existing legal, engineering, and agricultural conditions along nine typical streams used for irrigation in the State.

Irrigation in Field and Garden, by E. J. Wickson (Farmers' Bulletin No. 138, pp. 40, figs. 18). For note on this bulletin see page 200.

EXTENSION OF INVESTIGATIONS.

In response to numerous requests from those engaged in irrigation in the Hawaiian Islands, plans are being made for a bulletin dealing with the irrigation laws and customs which now control the ownership and distribution of streams in those islands. The immense sums of money already invested in pumping plants and irrigation works required for the irrigation of sugar cane gives to this subject an importance commensurate with the magnitude of these investments and with the value and scarcity of the water supply on which success depends. It is manifest that the same problems which have arisen in California and other arid States where streams have been fully utilized will have to be dealt with in these islands, and it is the belief of those most directly concerned that this investigation can greatly promote the enactment of needed and salutary laws by an early study of the subject and publication of the facts disclosing existing conditions and requirements.

The utilization of underground water is becoming each season more important, and it is destined to assume a general interest should irrigation be largely extended to the humid region. Requests for assistance in determining whether or not pumping water for irrigation will pay and the conditions which govern its profitable application are being constantly received, but thus far but little has been done in this direction, although a beginning has been made during the present season. It is one of the lines of work which can be usefully and profitably extended.

In all of the older irrigated countries irrigation and drainage have gone hand in hand, and the experience of the arid States is that we are not to be any exception to this rule. The building of high-land canals and the application of water to the farm beneath them sooner or later tends to create an excess of moisture in the lower lands. The percolating waters from the upper canals, or from the irrigated fields, carry with them an excess of alkaline salts which tends to accumulate in the bottom lands and thus render them worthless. As these salts are all readily soluble, drainage is the readiest and most certain means of removing both the excess of moisture and the excess of alkali, but

effective drainage is not a matter which the individual farmer can always provide. In many of the irrigated districts of the West the areas needing drainage are so extensive that these works, whether for removing the water already in the soil or cutting off supplies from the canals and fields above, must be carried out under a comprehensive plan, which in some cases involved not only farms and communities, but an entire valley.

This Office has been solicited to study this question, and a beginning has been made in this direction. From the nature of the problem, these improvements should be under public direction. In order to properly assist in the formation of plans for drainage of irrigation districts and the framing of laws to govern the organization of community or district improvements, this study should embrace the experience of the States of the Middle West, where drainage is already an important feature of agriculture and is carried out under State laws as a public improvement. The publication of a bulletin dealing with the operation of State drainage laws and the results which have attended their operation will greatly aid in the framing of laws required for the removal of the surplus waters of many Western irrigated districts. This investigation should also include the cost of manufacture and kind of materials required, because the salts contained in much of the water to be removed will destroy the tiling used elsewhere. Thus far the price of tiling has been so excessive as to be almost prohibitive. That this can be changed by the erection of factories within some districts to be benefited is certain. The investigation should show the feasibility of such factories, the places where the material for the manufacture of tiling can be obtained, and the approximate cost of such manufacture. At the present time clay tiling is the cheapest material in some sections, cement in others, and plank in others. The farmers of the West desire to know which they can employ to the best advantage.

Studies of the methods of irrigation, the duty of water, and the results of seepage and evaporation will be continued as before, the effort being made to encourage the agricultural experiment stations to take up the more scientific and detailed studies of the duty of water and leave to this Department only those larger problems of stream management which have a direct influence on the success of irrigation laws and the efficiency of public supervision in the distribution of the water supply. A number of the Western experiment stations are already paying increasing attention to this, the Montana, Utah, Colorado, and Arizona stations being especially conspicuous in this work.

The growing volume and immense cost of litigation over water rights and the certainty that these complications are destined to continue unless the operation of our irrigation codes is made simpler and more effective, renders it increasingly important that we avail ourselves of the experience of older irrigated countries. The lessons of southern Europe and Egypt should be made use of through visits to these districts, and the publication of reports showing the methods employed in the distribution of water, the methods of its application, and the volume required; the kinds of contracts under which water is furnished to users; the nature of the ownership of streams and of the canals which distribute them. The beginning of these studies has been unavoidably delayed, but their necessity and the value of the information to those engaged in framing codes of laws, or in enforcing those laws, is believed in more earnestly than when the same subject was referred to in the previous report of this Office. It is hoped that a beginning may be made in this work during the present year.

THE GROWING IMPORTANCE OF IRRIGATION.

It is becoming more and more apparent that irrigation is destined to have a larger place in the agriculture of the humid portion of the United States than a few years ago was thought possible. It is already employed as a means of insurance wherever intensive cultivation is resorted to. Market gardeners in New Jersey, in the vicinity of Boston, and around nearly all the large cities of this country are coming more and more to understand the security and profit which it brings. The rapid extension of rice irrigation in the South promises to influence the utilization of water in the growing of other products in that region wherever a supply can be obtained at a reasonable cost. The development of the arid region by irrigation is destined in the near future to cease to be a matter of local interest, and to occupy a leading place in National affairs. This is due to the fact that the vacant fertile lands of the inland States have now been taken up. We must look elsewhere to meet the demands of development, and it is the irrigated lands of the arid region which must replace the farms rendered unproductive by erosion and impoverished by wasteful and exhaustive methods of culture. To meet the growing home demand and to satisfy our expanding foreign trade will tax not only the utmost resources of the humid States, but the productive resources of the arid region as well. On the solution of the problems now being studied in this investigation must rest the laws which will govern the ultimate development of the large areas of public land yet awaiting settlement and reclamation. Its work is as important to the nation in aiding it to determine what it ought to do as in assisting the arid States in solving the problems which press for an immediate solution.

The fact must not be lost sight of that in the arid region agricultural values inhere in water rather than in land. In many sections of the West the right to water which irrigates an acre of land is already worth far more than the land itself, and the methods by which titles to streams are acquired and the character of the ownership established has as direct a relation to the development of the West as the methods employed in the disposal of public land. It is just as necessary, too, for the peace and prosperity of that region to keep streams from being acquired by speculative owners as it is to keep the land from being disposed of to speculative holders. In some cases extravagant and unjust grants of water have led to serious abuses, and it is only through a general education of the people most concerned that the expulsion of these abuses and the establishment of correct methods can be secured. The great work of this investigation is to promote the evolution of irrigation laws and customs suited to the needs of the different sections of the arid region and necessary for the protection of the individual farmer. As irrigation has extended and streams become more fully utilized it has become increasingly apparent that water laws are fully as important as land laws, and that it is not only necessary to define clearly the rights of each of the multitude of users from a common supply, but to provide adequately for the protection of these rights under some sort of public supervision, so that the peaceful and orderly division of rivers among farmers shall not only be possible but assured. It is also indispensable that there shall be men especially trained for this work. Under the most favorable conditions the harmonious division of a river is a complex and difficult performance. It involves the regulation of rights on tributaries so as to protect the rights on the main stream and a consideration of the

needs of the farmer whose land lies scores or even hundreds of miles away from the snows which must moisten it in order that he may not be robbed by the farmer whose ditch or canal taps the water supply at the mountain's base. It involves the adjustment of diverse and conflicting interests of individuals, communities, and sometimes of different States. Because the whole subject is new, development has outgrown organization. We have built ditches and dried up streams faster than we have evolved laws and customs for the protection of the users of their waters. The beginning of this investigation was the beginning of a disinterested and scientific study of these questions. The value of these labors is now becoming manifest in all of the different States of the arid region. It has stimulated the movement for better laws and in many cases has resulted in a reform in methods that has increased yields and extended the area cultivated. With these changes there has come a demand for information and advice wholly beyond our means to supply. It now is confronted by two needs—increased means for more comprehensive study of facts, and a larger force of trained and capable men to assume the important responsibility of directing the gathering of these facts and the interpretation of their significance when secured.

For continuing and extending the irrigation investigations an estimate of $75,000 was made a year ago. With the progress of our work during the year the demands for its extension from various quarters have increased and the opportunities for the useful employment of a larger fund have widened. I therefore recommend that this amount be asked for in the estimates for the ensuing fiscal year.

REPORT OF THE DIRECTOR OF THE OFFICE OF PUBLIC ROAD INQUIRIES.

U. S. DEPARTMENT OF AGRICULTURE,
OFFICE OF PUBLIC ROAD INQUIRIES,
Washington, D. C., August 31, 1901.

SIR: I have the honor to submit herewith the report of the Office of Public Road Inquiries for the fiscal year ended June 30, 1901, together with an outline of the work for the current year and recommendations and estimates for the ensuing year.

Respectfully,

MARTIN DODGE,
Director.

Hon. JAMES WILSON, *Secretary.*

WORK OF THE YEAR.

The work of this Office during the fiscal year 1901 was continued and extended along the lines laid down in my previous reports and in pursuance of the general plans and purposes of the inquiry. The correspondence of the Office has steadily increased during the year and the office force has been busily engaged distributing large quantities of literature to farmers, road builders, and other interested persons. Representatives of the Office visited nearly all the States and made scientific investigations regarding local conditions, road materials, etc. The information secured is being prepared for publication, and will be of much practical benefit to the interested localities. Several State legislatures have asked for and received assistance in framing new road laws. Farmers' organizations, farmers' institutes, business organizations, schools, colleges, etc., have also petitioned for our cooperation and advice and all of them have been accommodated as far as our resources permitted.

The progress of road construction has been closely watched, and it is very gratifying to note that never before in the history of this country has there been so much interest taken in the subject, and so much actual road work done as in the past year. More requests have been made for the expert advice and supervision of this Office than ever before. Every effort has been made to meet these demands, but this has been possible only to a limited extent, owing to the present small force and limited resources of the Office. This practical side of our work has been pushed forward as rapidly as the time and means at hand would permit. The object-lesson methods of teaching practical road building, adopted and carried forward by the Office for several years, have become so valuable and are so highly appreciated that there is an urgent and widespread demand for their continuation, and many calls are being made for their extension.

PRESENT ORGANIZATION.

The Office as now organized has an administrative office consisting of a Director, an assistant director, one special agent and expert, a stenographer, a clerk, and a messenger.

The road-material laboratory is operated in collaboration with the Bureau of Chemistry, and Mr. L. W. Page is in charge with three permanent assistants and one temporary assistant.

REPORTS ON FIELD WORK.

As indicated in my last report, the United States has now been divided into four divisions, known as the Eastern, Southern, Middle, and Western, with a special agent and expert in charge of each.

EASTERN DIVISION.

Mr. L. W. Page, the special agent in charge of the Eastern division, having been placed at the head of the road-material laboratory, has been engaged during the greater part of the year in work connected with the testing of road materials, and the field work of this division is therefore not reported upon.

SOUTHERN DIVISION.

Prof. J. A. Holmes, of North Carolina, was appointed special agent of the Southern division on August 7, 1900. During the year Professor Holmes has visited portions of nearly all the States of his division, examining into the character and distribution of materials suitable for road building. In many of the localities visited he has collected samples of material, which have been forwarded to the Washington testing laboratory, and the results of these investigations have been reported directly to the State, county, or municipal authorities especially interested in the matter. Special reports embracing the results of these investigations will be submitted at an early date.

While the chief purpose in Professor Holmes's travels through the Southern States has been the examination of the road-building material, he has endeavored at the same time, as an object of scarcely less importance, to encourage and organize the good roads movement in the several States in every way possible. With this object in view he has visited the county and State authorities, and in many cases has advised with them as to the best plans for promoting this movement. He has also given public lectures on road building at the State universities of North Carolina, Georgia, Alabama, and Louisiana, and at various towns in the different States; he has also appeared before legislative committees in the interest of good-road laws in the States of North Carolina, South Carolina, Georgia, Tennessee, and Virginia. On all these occasions he has advised (1) the establishment of State highway commissions; (2) the abandonment of the old system of compulsory road labor, and the substitution therefor of a system of road building and repairing roads by taxation; (3) the use of convict labor in road building. These are important features of any system that may be adopted for the improvement of the public highways. I am glad to be able to record the fact that in each of these Southern States this view of the situation is being generally accepted, and will doubtless be acted upon as rapidly as practicable. During the year

advanced legislative measures for making better roads have been adopted in both the Carolinas, Georgia, Tennessee, Arkansas, and Texas, and it is safe to predict that similar action will be taken in other Southern States at the next sessions of their respective legislatures. During the year Professor Holmes has endeavored to collect accurate information concerning the status of the road movement in every county of the States named, and he has thus far brought together such information from more than 1,000 out of a total of about 1,200 counties. The results of these inquiries are being tabulated and will appear in a bulletin to be submitted for publication at an early date. The reports indicate decided progress in both road legislation and practice in many portions of these States. Professor Holmes is also bringing together in a systematic record the names and addresses of a number of the most progressive citizens living in each of the counties of the division, and through these persons it is hoped that, by means of correspondence and by the distribution of printed matter, much can be done in the way of stimulating and guiding the good-roads movement.

In addition to a paper on "The use and results of convict labor in road building," for the Yearbook for 1901, the special agent for this division has now in preparation and will soon submit for publication reports on "Some types of road building in the Southern States" and "The present status of the good-roads movement in the Southern States."

MIDDLE DIVISION.

In September, 1900, Hon. J. H. Stout, of Menomonie, Wis., was appointed special agent for the Middle division, and Expert Charles T. Harrison was sent to him as assistant. Owing to the lateness of the season, no outside work was engaged in other than that done at Traverse City, Mich., to be referred to later on in this report. Soon after entering upon his work a visit was paid to the county fair at Kewaunee, Wis., where consultations were held on the matter of road improvement and an address was delivered. A farmers' institute at Knapp, Wis., was also attended for the same purpose.

During the winter months the educational feature of the work was taken up, and visits were made to the agricultural college at St. Anthony Park, Minn., where several addresses were made to special classes as well as to the students. Frequent conferences were held with county and State school officials relative to arranging for a series of illustrated addresses on road construction in the public schools, and this plan will very likely be carried out in the near future. Many requests were made for aid and information throughout the Middle division, but on account of the unseasonable weather and the lack of sufficient funds but little beyond the giving of written or printed information could be done.

About the middle of April, Road Expert Harrison was called from this division and assigned to the National Good Roads Association's train, which he accompanied on its tour of nearly 4,000 miles, during which time he acted as consulting engineer, and delivered addresses at several points where sample roads were built and conventions held.

ILLINOIS WORK.

During the months of September and October Mr. Howard H. Gross, of Chicago, was employed as special agent and expert for the purpose

of collecting and disseminating information in the State of Illinois. He cooperated with the officials of the State in building a sample road upon the State fair grounds at Springfield. He also delivered three addresses there upon the general subject of good roads.

Mr. Gross distributed among the farmers and business men of the State over 200,000 circulars of information. He visited, by invitation, 35 county and Congressional farmers' institutes and delivered addresses on "The relation of good roads to farm life," "How to build good roads and the cost thereof," and "Good roads viewed from the farmer's standpoint."

He made a special feature of State-aid legislation, and 31 out of the 35 institutes visited passed resolutions strongly indorsing such legislation as would provide for the equitable distribution between the State, counties, and townships of the cost of permanent roads. At the request of the legislative committee of the State Farmers' Institute, held at Winchester, Ill., on October 30, Mr. Gross prepared and presented to the legislature a bill that was known as the "Curtis bill."

The result of this work in Illinois aroused a deep and widespread interest in the subject of good roads, and this matter is now a leading topic of discussion by the press throughout the entire State. Public sentiment in Illinois in favor of better roads is rapidly crystallizing.

WESTERN DIVISION.

Mr. James W. Abbott, of Denver, Colo., was appointed special agent and road expert August 18, 1900, to take charge of the Rocky Mountain and Pacific Coast division. During his thirty years' service as a civil and mining engineer, Mr. Abbott has had much practical experience with the problems of road location and construction, but in order that he might be able to do the best work as a special agent he gave up his mining work, and has since devoted himself exclusively to the study of the road question and to practical work for the betterment of the highways in the large territory assigned to him.

He has had extensive correspondence with the various road commissions of the several States and of the Dominion of Canada, the directors of agricultural experiment stations, and many others. He has, by personal interviews and private letters, brought the subject of road improvement to the attention of governors and other State officials, the editors of leading newspapers, professors in institutions of learning, presidents and managers of railroads, prominent civil and mining engineers, members of the legislatures, boards of county commissioners, road supervisors, the heads of leading industries, manufacturers of road machinery, besides a large number of influential private citizens.

He attended and participated in the work of four very important conventions, at two of which he read papers. He has written several articles for publication in leading newspapers, and numerous interviews have been published giving accounts of his movements and work. He spent some time in consultation with the road committees of the Colorado legislature and assisted in framing a carefully prepared road law. He visited many places in Colorado, Utah, and California, and gave advice where it was desired regarding specific or general road improvement. Mr. Abbott visited, practically at his own expense, this Office and the highway departments of New York, Massachusetts, and California. In all he has traveled during the year over 12,000 miles.

Mr. Abbott wrote a paper on "Mountain roads" for the last Yearbook of this Department, which has since been republished in pamphlet form for general distribution. It was a technical article, giving detailed information regarding practice in mountain-road construction. The paper has been quite extensively republished in the press of different parts of the United States.

PRACTICAL ROAD WORK.

Requests for the practical cooperation and assistance of this Office in actual road building and in addressing meetings have been more numerous this year than ever before. Owing to our limited means, however, but few of these requests could be complied with. In this work the Office has endeavored to assist those sections of the country which needed help most, and to work in those States and communities where little or nothing had yet been done by us. The Office has also cooperated to the fullest extent possible in the construction of various kinds of roads and in the dissemination of information at road conventions and other meetings in the following States: Michigan, Alabama, Pennsylvania, Kansas, Illinois, Tennessee, Louisiana, Mississippi, Kentucky, North Carolina, South Carolina, Wisconsin, Minnesota, Iowa, Ohio, New York, Delaware, Maryland, Virginia, Georgia, Arkansas, Texas, Colorado, Montana, Wyoming, Nebraska, Utah, and California. Object-lesson roads have been built under the direction of the Office in the first nine of these States, while the results of our investigations and practical assistance in road meetings have been extended to all the others. From five to twenty-five addresses were delivered by representatives of the Office in each of these States. Brief reports of the most important work done in some of the States are given:

MICHIGAN.

A review of the work done during the early part of the fiscal year 1901 at Port Huron was given in my last report. Experts from this Office also assisted in building sample roads during road conventions at Saginaw and Traverse City. A brief statement of the work done at Traverse City will serve to illustrate the methods pursued by the agents of this Office at both these places. It may be given in the words of the special agent in charge, whose letter to the Office is as follows:

MENOMONIE, WIS., *October 30, 1900.*

DEAR SIR: As soon as possible after receipt of your request, I started for Traverse City, Mich. On arrival I found that the machinery for the sample stone road had not been assembled. By energetic work everything was in readiness by Tuesday noon, October 9. The work of crushing and placing the stone was pushed, so that on the first day of the convention there was a section of macadam foundation laid and rolled in readiness to receive the final surfacing of stone, a portion of which was spread and rolled during the convention.

The convention proper met in business session Thursday morning, October 11, when the address of welcome was made by Mayor A. V. Fredericks, to which I responded in your behalf. The balance of the session was devoted to reports and speeches from delegates from the thirteen counties represented.

In the afternoon the machinery, donated for the work by the Port Huron Engine and Thresher Company, was paraded through the streets of the city to the scene of the operations, the traction engine hauling a train of 10 heavy wagons loaded with delegates and other interested people. Addresses were made on the ground by Hon. Frank Hamilton, Thomas T. Bates, and myself, my address being on the lines of practical road construction, forcibly illustrated by the work in progress. A largely attended meeting held in the evening in the opera house was addressed by Hon. A. E. Palmer, of Kalkaska, and Special Agent H. S. Earle, of Detroit.

Friday, October 12, the road machinery was paraded to the Peninsula road, where an exhibition of spreading and rolling gravel was made. In the afternoon a trip was made to Garfield Township, where a fine object-lesson road was shown, illustrating the value of drainage in reclaiming swamp lands and the construction of a gravel road thereon. Brief addresses were made and questions answered by Hon. A. E. Palmer and myself.

At the request of the committee in charge I remained a week longer to assist in the completion of the work. When I left, October 18, there were about 800 feet of foundation placed and 325 feet of finished surface. The road had an average width of 10 feet and a depth of 8 inches of macadam made from crushed field stone of a good quality. Gravel shoulders were placed on each side of the stone construction. The cost of the work was approximately as follows: Drainage of the swamp lands, $300; graveling Peninsula road, $400; graveling about one-fourth of a mile of macadam road, $500. Incidental expenses in finishing the road brought the total cost of all the work done up to $1,500 or about $2,000 per mile.

Respectfully,

CHARLES T. HARRISON,
Special Agent and Road Expert.

Subsequent reports from Michigan show that after passing through a very severe winter the drainage of the Traverse City road has proved successful. The gravel road is still hard, smooth, and free from ruts, and the macadam first-class in every respect. As a result of this work Traverse City and vicinity are making rapid strides toward better streets and roads. The aid extended by the Office in this matter was greatly appreciated by the city and county authorities, and as a result efforts are being made for the holding of road conventions and the construction of sample roads at Cheboygan and Ludington during the present season. It will be impossible, however, for the Office to do more for Michigan this year, as engagements have already been made which will keep our present force busy for several months.

ALABAMA.

There is, perhaps, no other section of the country better supplied with good road material than the northern portion of Alabama. Immense deposits of the most excellent quality of chert are found in that State along the banks of the Tennessee River. This material, on account of the large percentage of silica, which gives it a good wearing quality, and of iron, which enables it to readily consolidate and form an impervious mass, makes one of the most desirable and valuable road materials found anywhere in the country. The people of Florence, Ala., appreciate the value of this material, but the county road officials, realizing their inability to apply it to the best advantage, made an application to the Department to assist them in building a short section of road out of their local materials. Mr. Eldridge, assistant director of the Office, was sent there during the month of August, 1900, to investigate and experiment with this material, and the result seems to have been highly satisfactory. Previous to this experiment, the county authorities had been using "creek gravel" in preference to the chert, owing to the fact that the gravel could be secured with little or no effort, while the chert had to be laboriously dug from the bank. Mr. Eldridge built a section of road with the pure chert and a section composed of creek gravel as a foundation and chert as a surface. The roadbeds were well drained, graded, shaped, and rolled, and the materials were spread and rolled in two courses, each 4 inches in thickness. The material was blasted out with dynamite and powder. It was found by experiment and a study of existing roads that the chert was much more satisfactory than the gravel previously used, but that such gravel could be used, provided

it be surfaced with enough chert to hold it in place and to prevent its washing into the side ditches.

Chert roads can be built in northern Alabama at from $200 to $500 per mile, and we believe, if the work is properly done, that they will last for many years with but little repair, and that their surface will be as smooth and hard as that of the best stone and gravel roads. The success of this work is shown by the following extract from the Florence Times:

> The Times, in connection with the public-spirited citizens of Lauderdale County, wishes to tender grateful thanks to Mr. M. O. Eldridge, the assistant director of the Office of Public Road Inquiries, for the valuable .esson in road building which he recently gave to our people. We hope it will prove, as it should be, the forerunner of economical and practical road building in our county.

PENNSYLVANIA.

At the close of the last fiscal year, work on an object-lesson road at Doylestown, Pa., was still being carried on, but was not completed until early in the fall. This work, brief mention of which was made in the last report, was about one-half mile in length, one-eighth of a mile being 8 feet wide, the balance 12 feet wide, with earth shoulders sloping to wide open ditches. The old earth road was considered one of the worst pieces of public road in that section, having an exceedingly sharp grade, with a miry strip at the foot of the hill caused by the lack of proper facilities for carrying off the water. Considerable cutting and filling was done and the grade was reduced to an average of 3 per cent. Native stone of a good quality was used. On part of this road a telford foundation, 6 inches deep, was laid; the surface was composed of native trap rock, machine broken, laid to a depth of 3 inches and dressed with screenings. Another portion of the work was of macadam construction, with a depth of 6 inches, laid on a hard natural foundation. Considerable difficulty was experienced in hauling water, getting teams for the roller, etc., but in spite of these obstacles, a good road has been secured, which stood last winter's freezes and thaws surprisingly well. The cost of the work was $1,520.50, and a bid has been submitted to finish the road to Doylestown Borough for $1,100, which would make the cost of a mile of road $2,620.50.

At the National Farm School the experimental work, conducted by Expert Charles T. Harrison, resulted in road construction being added to the school curriculum, and the building of a good earth road 1,200 feet long by 20 feet wide in April last by the students under the direction of Prof. W. T. Pope, horticulturist. This road leads from the object-lesson road to the school building, and is known as "Memorial lane."

At the request of Congressman Acheson and other prominent citizens of Washington County, Pa., the Office secured the loan of a complete road-building outfit and supervised the building of about a mile of object-lesson road in North Strabane Township of that county. Hard-road material in that part of the State is very scarce, but the county authorities were fortunate in securing enough limestone of good quality to build this road, and, when our machinery and experts arrived, this material had been piled up along the road ready to be crushed. The machinery consisted of a rock crusher, elevator, screen and bins, road machine, and road roller. It was loaned to the Department by the Champion Road Machine Company, and was transported from Kennett Square to Canonsburg, Pa., by the courtesy of the Pennsylvania Railroad Company.

The sections of road selected for these experiments are located near the old McMillan Church and radiate from the church in four different directions, about a quarter of a mile of macadam road being constructed on each of these radiating roads. A West Virginia brick-making establishment presented the township with a carload of paving brick, which was also used in making an experimental piece of brick road on the section leading from the McMillan Church toward Canonsburg.

Under a new law, permitting the employment of convicts on the public roads of Pennsylvania, about a dozen prisoners from the county jail were used in quarrying the stone and in building this experimental piece of road. The use of convicts proved entirely satisfactory, and it seems probable that Washington and adjacent counties will in the future utilize misdemeanor convicts in similar work.

Washington County is very hilly and some grading had to be done. After this was completed the foundations were well drained, prepared, and rolled in the usual manner, and the stone was applied in three separate layers, each layer being rolled until smooth and compact. The width of the material was about 10 feet and the depth when rolled about 6 inches. Wide earth shoulders were prepared on each side sloping uniformly to the side ditches in such a way as to allow vehicles to pass. After a sufficient amount of road had been built, a "road day" was arranged for, and the farmers from every section of that and adjacent counties were invited. This demonstration was planned for the purpose of spreading knowledge of road making among the farmers and county road officials. The meeting was well attended, about 500 farmers being present, and the work seemed to arouse the entire countryside.

The following letter from Congressman Acheson shows his appreciation of the work done in Washington County by this Office:

WASHINGTON, D. C., *February 1, 1901.*

SIR: Inclosed find letter of ex-Sheriff W. C. Ramsey, of Washington County, Pa., in reference to the cooperation of your Department in the construction of a sample road in South Franklin Township of that county. In this connection, I wish to say that the experiment made in Washington County last fall under the direction of Mr. Eldridge awakened a deep interest among the farmers, and has done a great deal to promote the cause of good roads. I should like to see the appropriation increased, so that you could undertake such experiments in every county in the country.

Yours, truly, ERNEST F. ACHESON, M. C.

KANSAS.

A very successful State good-roads convention was held at Topeka, Kans., September 25–28, 1900. The citizens of Shawnee County raised the necessary funds to build 1½ miles of macadamized road, a section of which was constructed under the supervision of Mr. E. G. Harrison, of this Office. The rock for this work was shipped in already crushed, being a by-product from one of the mines near Topeka. The construction of the road was carried on during the convention, thus serving as an object lesson. Mr. Harrison and the Director were on the ground during the progress of the work in order to explain the details of practical and theoretical road building to the delegates. Two carloads of machinery for this work were loaned by the Port Huron Engine and Thresher Company, and were carried to Topeka by the railroads without cost to this Office.

The objects of this convention were to awaken and promote a general interest in the improvement of the public roads of Kansas, and

to discuss the various ways and means of securing the necessary funds for this purpose, as well as the best methods for constructing and maintaining good roads. I believe that these objects were fully attained.

WORK OF THE "GOOD-ROADS TRAIN."

During the months of April, May, June, July, and August, 1901, this Office cooperated with the National Good Roads Association of Chicago in the operation of a "good-roads train" through the Mississippi Valley from New Orleans to Chicago. The Illinois Central Railroad furnished the train, including 9 cars for machinery, 1 car for laborers, and 1 combination dining and sleeping car for road experts and officials and the press representatives. The railroad company also provisioned the train and furnished part of the skilled and common labor. The machinery was loaned by the manufacturers, who also supplied experts to operate the same.

The Director accompanied the train on its initial trip from Chicago to New Orleans and through a portion of Mississippi, delivering addresses at several conventions. Leaving the train at Jackson, Miss., the assistant director of the Office joined it there and represented the Office during the remainder of the trip. Road Expert Charles T. Harrison, of this Office, accompanied the expedition, but, being at this time on furlough without pay, his expenses, together with compensation for his services, were paid by the National association.

The "good-roads train" visited the following places, where sample roads, varying in length from a half mile to 1½ miles, were built and where the officers of the National association organized permanent local and State associations: Flossmoor, Ill.; New Orleans, La.; Natchez, Vicksburg, Greenville, Clarksdale, Oxford, Granada, McComb City, and Jackson, Miss.; Jackson, Tenn.; Louisville, Hopkinsville, and Owensboro, Ky.; Cairo and Effingham, Ill.

About 20 miles of earth, stone, and gravel roads were built and 15 large and enthusiastic conventions were held. The numbers attending these conventions and witnessing the work were very large, in nearly every instance more than a thousand persons and in some cases 2,000 persons being present. Among the attendants were leading citizens and officials, including governors, mayors, Congressmen, members of legislatures, judges of the county court, and road officials. This was undoubtedly the most successful campaign ever waged for good roads, and the expedition has been of great service to the cause, and especially to the people of the Mississippi Valley.

TESTING OF ROAD MATERIALS.

The importance of laboratory tests on road materials has long been recognized both in this country and in Europe. For over thirty years the national schools of roads and bridges of France have conducted careful tests of all materials used in the construction of National highways. These laboratory tests have been the means of greatly reducing the cost of road construction, and it is a well-known fact that the French roads are the best in the world. Since 1893 a number of laboratories for testing road materials have been in operation in this country, and their aid to road builders in obtaining good and economical results has been thoroughly demonstrated.

In Decemi er last we established a road-material laboratory, which occupies comfortable quarters in the building of the Bureau of

Chemistry. This laboratory is now in full operation, and any citizen of the United States interested in the construction of public highways can have road materials tested free of charge.

The methods employed in this laboratory are very practical and in many respects original, and the work done has proved most satisfactory. The general methods employed are briefly as follows:

When an application to have a sample tested is received at the laboratory, a blank form is sent to the applicant to be filled out with necessary information regarding it. The sample is then subjected to an abrasion test to determine its resistance to wear; a cementing test for determining its cementing or binding power; a toughness test; and a hardness test. Other information regarding the sample is also secured and furnished to the applicant, such as its density, absorptiveness, and proper nomenclature.

When expert advice is asked as to the suitability of two or more samples for a particular road, a blank form for making a fourteen-day census of the volume and character of traffic over that particular road is sent to the applicant to be filled. When this information is received at the laboratory a request is made to the Weather Bureau to supply a record of the meteorological conditions obtaining in the particular locality through which the road passes. From a study of these combined data the expert in charge of the laboratory is able to make a thoroughly scientific selection of the material best suited for the particular road. This method of selection eliminates, as far as possible, any personal error, and makes what has been heretofore a very complicated problem one of simple engineering.

Up to the present time about 100 samples of rock have been received and tested at the laboratory, and applications for tests are being received in steadily increasing numbers. Most of the machinery and appliances had to be especially built for the laboratory. These were designed by Mr. L. W. Page, who is in charge.

URGENT DEMANDS FOR OFFICE ASSISTANCE.

The state of public opinion regarding the work of this Office, the character of the demands made upon it, and the pressing need for an extension of the work can best be shown by a few brief quotations from the thousands of letters, newspaper clippings, and copies of resolutions on file in the Office.

FROM CORRESPONDENTS.

Mr. James W. Thompson, a prominent gentleman of Louisville, Ky., in acknowledging a copy of our last Yearbook article, says:

> I wish to thank you, the Department, and the Hon. Martin Dodge for the help you have given us in Kentucky on the good-roads question, as without it we could not have accomplished what we have.
>
> I hope Congress will make a more liberal appropriation for the maintenance of your Office, which I think is one of the most important connected with the Government. What you have accomplished with the small appropriation you have is something wonderful.

Mr. Arthur T. Neale, director of farmers' institutes for Delaware, writes:

> The managers of the farmers' institute would like to give much time to meetings devoted to the road question this winter. * * * May I ask whether lecturers can be secured for institute work from among those holding positions under you?

The Director is almost daily in receipt of requests similar to the following, which was made by a correspondent from Florida. He urges the Director to attend the annual convention of the Good-Roads Association of Florida, and adds:

I believe that an efficient stereopticon lecture, giving a bird's-eye view of the most important public roads of the world, would not only be instructive, but would give a new impetus to good roads throughout this State. I most respectfully request you to send such a lecturer to be with us the nights of the 20th and 21st of February next in Jacksonville for the benefit of the members of our convention and the public generally.

Senator Shoup, of Idaho, refers a letter to this Office, indorsed as follows: "With the earnest recommendation that the Department lend such assistance as is possible to the citizens in the vicinity of Genesee, Idaho, in improving the roads in that locality." The Senator's correspondent writes as follows:

The roads in southern Latah County are much the worst in the State and the roads in the vicinity of Genesee are worse than in any other part of this county. Our people are stirred up over the matter and propose to do something to better the roads, and would like the assistance of the Government Road Division. If you can help us to secure the advice and assistance of the Road Bureau you will confer a favor on the entire community and place us under great obligations to you.

The Citizens' Association of Ludington, Mich., makes the following petition:

We are now about to spend a large sum on macadam road work. We stand in need of some instruction; not only the council, but citizens generally need to understand the subject. It is new here. Can Mr. Harrison, or some other expert, come here; if so, at what expense to us? The sooner the better, of course, as we are now at work.

Congressman Pearre, of Cumberland, Md., writes:

I was talking to you some time ago about building a sample road in Allegany County, Md. Will you be able shortly to construct a half-mile sample road in Allegany County for me? I have authority from the county commissioners to proceed with the matter, with the understanding that they will pay such share of the expenses as is usual in such cases. I am anxious to have this done as soon as possible.

Captain Shaw, of the United States Navy, in a letter on file in this Office, says:

Realizing the great advantage to the cause of good roads from the construction of sample roads under the direction of the Road Inquiries Office, I respectfully suggest that such a road be built from Charlottesville, Va., to Monticello, the grave of Jefferson, a distance of about 2 miles.

This location is peculiarly adapted to the purpose, first, because that grave is visited yearly by a great number of people from every part of the country, making a road thereto a National rather than a local object lesson; and, second, because Charlottesville is an educational center for the South, having some 700 students from its various States.

The number of persons visiting such a road would naturally be largely increased by the fact that Charlottesville is the point of junction of the two great railroad systems—the Southern and the Cheasapeake and Ohio.

If, in view of the foregoing, it should be decided to build such a road, I respectfully request information as to what aid would be given by the Department in regard to inspection of material, technical supervision, etc.

The following letter has been received from Marshalltown, Iowa.

I understand you are doing some experimental road work in the different States. If this is the case, we are very desirous to have you aid us with one of your experiments. We are much in need of a better system of roads leading out of Marshalltown into the country. We have ideal experimental ground, taking in many different phases of road work in a very short distance, such as drainage, bottom lowland, and hill work.

Will you kindly advise me what you are doing along this line, and can you aid us along your lines of work?

An eminent correspondent from the State of Oregon writes:

I am not opposed to a reasonable effort on the part of the Government in advancing scientific explorations of every kind, but this is one of more importance than many others. It involves the question of cheap and rapid transportation of the products of the farm to market. * * *

I hope that your appropriation will be increased and that your Department will urge the matter before Congress. This subject is of more importance than improvements of rivers and harbors or armies and navies, however important they may be.

The following communication from the Tama, Iowa, Business Men's Association, addressed to the Secretary of Agriculture, will be of interest:

We have noticed with a great deal of satisfaction the interest displayed by your Department in the pressing question of improved public highways, and desire to be permitted on behalf of the organization which we represent to convey by this our appreciation of the efforts being put forth by you in the "good roads" movement.

Right immediately south of our city lies the Iowa River bottom, one of the garden spots of the State, but to cross which with a load of farm products during the rainy seasons is nearly impossible. There were weeks during the early part of the past winter when it was almost impossible for the farmers to get to or from the city of Tama from the south even with empty vehicles.

There is but one public highway leading south from this city, and about 3 miles of this lies across the river bottom, with its "mucky" black soil, which for road purposes is much like a thick composition of South Carolina pitch.

A movement has just been started by the Tama Business Men's Association looking to the proper draining, tiling, and graveling of this 3 miles of public highway. The work must needs be done by popular subscription, and your experience will remind you that the task of raising funds for its prosecution is no small one.

Knowing your interest in the movement for the betterment of our highways, and understanding as we do that you have under the direction of your Department competent and expert talent, we very respectfully and earnestly ask if you can not see some way to send us some help. A practical road engineer who could make the surveys, profiles, estimates, etc., working under your Department would be a boon which would be held in grateful remembrance by a host of Tama County citizens.

FROM THE PRESS.

Hundreds of earnest editorials and articles have been written during the past year setting forth the value and importance of the work of this Office, many of these urging its extension and some of them insisting upon a larger appropriation. It would be impossible, in this report, to copy even the most important clippings, but on account of the deep interest felt in the matter, a few extracts to illustrate the sentiment of the press generally are appended:

[From the American, Baltimore, Md.]

It is proposed to appropriate hundreds of millions of dollars for a canal across the isthmus to accommodate the commerce of the world. If Congress can be so generous toward the world's commerce, it surely ought to be willing to make a small appropriation for domestic commerce, all of which is between American citizens. To build what is intended to be a great artery of commerce, and leave the veins which are to feed it in a more or less congested condition, seems to be the reverse of good statesmanship. Education is what the public needs in the matter of good roads. It must be shown that it costs little more to build and maintain them than bad ones, and that the good roads put vastly more money into the pockets of the taxpayers than they take out of them. Congress, if it will, can teach this lesson without seriously impairing the balance in the Treasury.

[From the Journal, Boston, Mass.]

The General Government can not embark upon the work of actual road construction on a large scale, but it can promote and systematize this work when

undertaken by States and smaller communities, and it can accumulate information which will prevent the waste of money and effort. The Department of Agriculture, already of great use to the agricultural interests, will extend the value of its service by this new enterprise.

[From the Herald, St. Joseph, Mo.]

The good roads congress does not ask the Government to build good roads for the country, but it does ask that the Department of Agriculture be given an appropriation with which to build sample roads and spread information about them among the people. It recognizes the fact that road building is the business of the people themselves, and thinks that they will not put up with poor roads longer than it takes them to learn the advantages of good ones.

[From the Journal, Elizabeth, N. J.]

The Government, through the Agricultural Department, with a small appropriation, has already built a number of sample roads—very short ones—and the instruction thus given has been of great value, and has proven an incentive to the building of many miles of good roads. A larger appropriation would doubtless prove proportionately beneficial. There are many sections of the country which do not yet appreciate good roads, and do not know how to build them, and Government instruction with object lessons in those sections can hardly fail of good results. Moreover, good roads help the Government in the way of establishing rural free deliveries.

[From the Chronicle, Marion, Ind.]

Congress may pass a ship subsidy law; the rivers and harbors may receive appropriations; Federal buildings may appear in many small cities; but in all this, we, of Indiana, are not directly interested. The prime thing with the people of this State is good roads. The greater number of the citizens of the State are vitally interested in local transportation facilities.

It is suggested that Congress appropriate for the Department of Agriculture a sum for the building in every State of one sample of good country road. It is remembered that while $14,000 was set aside by Congress for the Road Inquiry Bureau last year, $20,000,000 were appropriated two years ago for rivers and harbors; and this may be doubled soon. In these the people of the inland country have no direct interests. The people of Indiana do not contend that there should be no expenditure on rivers and harbors, but they have come to the conclusion that the roads of the country, being close to the home, being the first thing of vital importance in a community, should have a larger degree of consideration at the hands of the promoters of public good.

[From the Mercury, San Jose, Cal.]

It is not proposed that the General Government shall begin the work of road construction, but that it shall simply encourage it by making available the scientific knowledge of the Department of Agriculture in a practical way. This is certainly a worthy purpose. The improvement of our highways means as much for the welfare of the country, particularly of the producers, as does the improvement of the waterways and railroads. It is an important work of education which the Department of Agriculture is well fitted to undertake and carry on to the best advantage.

[From the Times-Star, Cincinnati, Ohio.]

It was also decided to ask the United States Congress to keep up its support of the Office of Public Roads, under the control of the Department of Agriculture. Excellent results having already been achieved through this Office, which devotes itself in the main to the diffusion of knowledge respecting the practical method of constructing good roads and to answering such questions as may be asked about road building generally. It is conceded that great good has resulted already from the agitation of this matter, and that the roads of the United States as a whole are to-day in vastly better condition than they were only a few years ago.

[From the Capital, Sedalia Mo.]

The Road Inquiry Bureau has been very helpful to the cause of better public highways during the past few years. It has gathered useful statistics and experimental information, and it has had a representation at nearly every conspicuous good roads convention held since the Bureau was established. It has distributed a great deal of good roads literature, and has been of real assistance to the move-

ment which has given several of the States greatly improved systems of public highways. Congress should by all means make liberal appropriations for this branch of the Agricultural Department's service.

RESOLUTIONS.

The National Good Roads Association, at its last annual meeting in Chicago, where delegates had assembled from 35 States of the Union, passed the following resolution:

Resolved, That we earnestly recommend that our Representatives in Congress be urged to obtain, if possible, an appropriation of at least $150,000 a year to be applied to the uses of the Public Road Inquiries under the Department of Agriculture in extending its work of education and instruction.

The State Grange of Delaware passed the following resolutions at its last annual session:

Whereas the more permanent and economical building of public roads is a question of vital importance to the farming community, and whereas the methods of construction and maintenance of such roads must vary with the nature of the country and of that of the available material; therefore

Be it resolved, First, That the organization of a National Good Roads Bureau under the United States Department of Agriculture has our hearty support.

Second. That the plan of that Bureau to furnish the engineering skill and certain pieces of heavy machinery necessary in construction of model roads in every State of this Union meets with our approval.

Third. That the section of the bill of the United States Department of Agriculture now before Congress, which provides for an increased appropriation with which to pay the expenses of such model road building, also meets with our approval, and we hereby direct our secretary to at once send a copy of these resolutions to our Senators and Representatives in Congress with the request that they give to this matter their active support.

Several large conventions, some of them comprising 2,000 people, have been held throughout the Central and Southern States under the auspices of the National Good Roads Association during the past year, and nearly all of these conventions adopted resolutions in favor of the work of this Office and its further extension. A few of these resolutions are presented.

The Louisiana State Good Roads Association, in convention assembled at New Orleans, adopted the following:

Resolved, That we heartily approve the work of the Office of Public Road Inquiries, and urge our Senators and Representatives in Congress to vote for suitable appropriations for carrying on and extending the same.

The Mississippi Good Roads Association, at Greenville, passed the following resolution:

Whereas the United States Government has large interests of commercial value in this State in the form of lands, post offices, and custom houses; and whereas through the Department the Government is expending large sums of money in the extension of rural free delivery in order that the agricultural classes may possess better mail facilities; and whereas rural free mail delivery to be economical must depend upon good roads: Therefore be it

Resolved, That the Good Roads Convention, through Hon. Patrick Henry and other Members of Congress, urge the Fifty-seventh Congress to make more liberal appropriations for the support and maintenance of the Office of Public Road Inquiries, now under the supervision of the honorable Secretary of Agriculture, in order that all States may receive reasonable consideration for road improvement.

The Tennessee Good Roads Association, at Jackson, passed the following resolution:

Be it resolved, That we earnestly request that the National Government continue the appropriations to the Office of Public Road Inquiries, and that this convention heartily appreciate and indorse the good work which it is doing.

The Western Kentucky Good Roads Convention, at Hopkinsville, passed the following:

We urge and recommend the members of Congress from western Kentucky to use their influence to secure sufficient appropriation for the Office of Public Road Inquiries under the Department of Agriculture of the United States Government.

We believe that the burden of common-road improvement must be shared by the taxpayers of each State, but we further believe and declare that the Federal Government should establish a sufficient bureau for the proper education of the people in the most economic and scientific methods of road construction in the several States.

The Kentucky Good Roads Association, in convention assembled at Louisville, passed the following resolutions, which are similar to those adopted by the convention which assembled at Owensboro, Ky.:

Resolved, That we earnestly recommend the Members of Congress from Kentucky to urge larger appropriations in the Fifty-seventh Congress for the support of the Office of Public Road Inquiries under the Department of Agriculture, in order that said Office may extend its education by distributing bulletins and constructing sample roads as object-lessons in all States and Territories. The Government owns lands, post offices, and custom houses in all States. It is deeply interested in extending rural mail facilities to promote the social and commercial advancement of the agricultural classes. We believe that the burdens of common-road improvement must be shared by the taxpayers of each State; but we further believe, and be it

Resolved, That the Federal Government should aid, through the Office of Public Road Inquiries, in educating the people in the most economic and scientific methods of road construction in the several States.

DEATH OF SPECIAL AGENT HARRISON.

The good-roads movement has sustained a severe loss during the year in the death of the veteran road builder, Mr. E. G. Harrison, who died in this city February 6, 1901, at the age of 73.

Mr. Harrison was one of the pioneer road builders of New Jersey, and the success of the movement in that State was largely due to his untiring zeal and conscientious work. For several years he had been connected with this Office as special agent and road expert, and during this time he directed the construction of object-lesson roads and demonstrated the importance of road improvement in nearly every State east of the Rocky Mountains. His presentations of facts and theories were unique and effective, and he was universally liked. His work for American highways was in many respects similar to that of John L. Macadam, the pioneer road builder of England.

PLANS FOR 1901–1902.

It is intended during the ensuing year to continue the work and enlarge its scope so far as the appropriation will admit. We have made only a small beginning in the work designed to be done throughout the country, and there are now on file numerous applications for our assistance. We have already had to forego numerous opportunities to take charge of the construction of sample roads where practically all the expense except that of our supervision was guaranteed. Under such conditions a minimum appropriation by the General Government can be used to accomplish a maximum of good results.

Out of a large number of requests for practical cooperation, five places have been selected where this Office will assist in building

object-lesson roads. These places are Buffalo, N. Y.; Cumberland, Md.; Charlottesville, Va.; Jonesboro, Tenn., and Tama, Iowa. In the work at Buffalo we will cooperate with the National Good Roads Association in building sections of the various kinds of roads, including earth, gravel, macadam, tar macadam, brick, etc. We will also assist in the International Good Roads Congress, which is to be held in Buffalo September 16–21, 1901.

The money has already been raised and the preliminary arrangements made for the building of about a mile of macadam road near Cumberland, Md., and we expect to go forward with that work as soon as the Buffalo meeting has adjourned.

Preliminary surveys and estimates have been made for the construction of an object-lesson road from Charlottesville, Va., to the old home and tomb of Thomas Jefferson, and prominent citizens of Virginia have asked the assistance of this Office in the construction of this road, which is to be called the "Jefferson Memorial Road." As soon as the grading is completed an expert will be sent there to direct the construction of a model macadam road, and when a sufficient section has been finished, the Director of the Office will go there to attend a State good-roads convention, which will be composed of representatives from all parts of the State.

It was decided by Congress at its last session to build a National soldiers' home near Jonesboro, in East Tennessee, and several prominent citizens of Jonesboro, including Congressman W. P. Brownlow, have requested us to send an expert there to direct the construction of a first-class macadam road from Jonesboro to the new soldiers' home. If our funds hold out this request will be complied with.

Last March, by your direction, Expert Charles T. Harrison was sent to Tama, Iowa, to consult with prominent citizens and road officials as to the best methods of improving the roads in the Iowa River bottoms near Tama. Mr. Harrison reports that the roads, although in their worst condition, were just right for inspection. He also says that material for the proper surfacing of these roads can not be easily secured, but by applying modern methods of drainage, the dirt highways can be vastly improved. The citizens of Tama have requested us to direct the construction of a short section of road as an object-lesson and to cooperate with them in holding a good-roads convention. If sufficient funds can be raised at Tama for the building of a half mile or so of road, the request will be complied with.

Prominent citizens of Marshalltown, Iowa, are also desirous of having a short section of a road improved under our directions, and it may be possible to do some work there also while the Tama work is in progress.

The National Good Roads Association contemplates the making up of another "good-roads train" to be operated in the Southern States during the coming winter, and, if arrangements are completed for this project, this Office should cooperate to the extent of furnishing a road engineer to direct the construction of object-lesson roads and to deliver practical addresses at the road conventions.

The Office will also endeavor to comply with as many as possible of the requests which are now on hand, and which are constantly being received, to assist in farmers' institutes and other meetings during the coming winter and spring. Many of these requests are referred to our division agents, but a majority of them have to be met by the office force.

RECOMMENDATIONS AND ESTIMATES FOR 1902-1903.

It is proper just here to call attention to a misconception which appears to exist in the minds of some to the effect that increased appropriations for this work may lead to National aid. It should be distinctly understood that the work of this Office, like that of many other Divisions of the Department, is purely educational. In requesting an increased appropriation it was not the intention to shift the burden and responsibility of constructing improved roads from the States and counties to the General Government. Such a plan is not feasible, and even if it were, it would not be desirable, for there could be no surer way of postponing the building of good roads than by making them dependent upon National aid. Under such a system States and counties would wait for National aid and little or nothing would be done.

In order to meet the constantly increasing demands that are being made upon us from time to time for practical assistance and advice, it would be advisable to organize two or three outfits of road-building machinery, including rock crushers, screens, rollers, road graders, etc., and to send them to the various places which have asked for the cooperation of the Department, and where preparations have been made for actual road construction. Each of these outfits should be accompanied by one or two practical road builders and a competent road engineer to direct the work.

Heretofore this Office has been aided generously by the loan of road-making machinery, but the time has now come to abandon this make-shift policy and for the Government to purchase its own equipment for object-lesson work. This item of expense would not be a large part of the total sum needed and recommended. The leading railroads are deeply interested in the improvement of the public highways and have heretofore carried all our machinery free of charge, and it is thought that they can be relied upon in the future to carry it at a comparatively small expense to the Government.

If an appropriation is made by Congress for carrying out this plan, the only expense to the Department will be the salaries and traveling expenses of the engineers and expert road builders, the cost of the machinery, and the freight on the same from point to point. The local authorities would cheerfully furnish the road materials, which could be selected by our divisional agents and tested in our laboratory. They would also contribute the common labor, teams, and fuel, and attend to the grading down of hills, if that should be required.

This plan has been operated to a limited extent by the Office for several years, and during the months of April, May, June, and July almost the same project was carried on by the National Good Roads Association in cooperation with this Office. It is but proper to state here that this object-lesson work could not have been entered into by the Office but for the National association, which paid the expenses, including the salary of our own engineer and a portion of the traveling expenses of the Director and assistant.

The general adoption of this method of experimenting and disseminating practical information establishes a very wide cooperation, comprising the Department, the railroads, the various local road authorities, the agricultural colleges and experiment stations, and interested individuals. It makes the expense of building experimental and sample roads very easy to be borne, and would enable the

Government with a small expenditure to accomplish much practical benefit.

Scientific road building necessitates not only the consideration of local conditions, such as climate and soil, rainfall and drainage, but also a study of available materials adjacent to the road. To transport materials a great distance adds so much to the cost as to render roads scientifically constructed of foreign materials impracticable. Competent road builders should discover and test the available materials and show by practical object-lessons how the most good can be made of them with the least possible expenditure of money and labor. The best materials are not always discovered, and thousands of dollars are wasted in this country annually by the use of poor materials where a little expert study and advice would have developed good materials close at hand. The best methods of using these materials are oftentimes unknown, and money is wasted in their improper application. All these things require scientific study and investigation. The people of the country are now interested in this matter as never before, and they are demanding and are sorely in need of authentic information along these lines. Furthermore, this is a work which the Government can do for them much better and more economically than they can do for themselves.

After having considered all letters, requests, and resolutions which have come to the Department, and after consulting and corresponding with many of the most prominent farmers and road advocates throughout the country, I have the honor to recommend that Congress be asked to increase the appropriation for this Office for the next fiscal year to $75,000. If this increase is granted, I would recommend that there be devoted, provisionally, to investigations and educational work $1,000 in each of the States and Territories, and that the balance be used in defraying the running expenses of this Office and the road-material laboratory.

The necessity of furthering the work of this laboratory is felt all over the country, and at least $10,000 is needed for carrying on this branch of the work for the next fiscal year. The small sum of $1,500 heretofore allotted to each of the four divisions of the country is not sufficient to pay the salary and expenses of competent persons. The Department should be able to command the entire time and attention of those representatives, but in order to do this at least $2,500 should be set apart for each division.

Our small force has been so completely occupied with outside work that the preparation of didactic literature had to be neglected. This branch of the work should also receive more attention, especially the collection, illustration, printing, and distribution of practical and scientific information. I trust, therefore, that you will find it within your power to secure at least $75,000 for the use of this Office for the next fiscal year.

When the last report was submitted there was some doubt as to whether we could secure a sufficient number of trained men to carry on extensive investigations in the various States, but during the past year the Office has devoted a great deal of attention and study to the selection of persons who are sufficiently skilled to inaugurate this work. It is gratifying to announce that we are now prepared to greatly extend the work of this Office, and the appropriation above mentioned, if granted by Congress, will be expended judiciously and wisely.

REPORT OF THE CHIEF OF THE DIVISION OF ACCOUNTS AND DISBURSEMENTS.

U. S. DEPARTMENT OF AGRICULTURE,
DIVISION OF ACCOUNTS AND DISBURSEMENTS,
Washington, D. C., August 1, 1901.

SIR: I have the honor to submit herewith a brief report of the work of this Division for the year ended June 30, 1901.

Respectfully,

F. L. EVANS,
Chief.

Hon. JAMES WILSON, *Secretary.*

WORK OF THE YEAR.

APPROPRIATIONS, EXPENDITURES, ETC.

The total amount appropriated by Congress for the several lines of work of the U. S. Department of Agriculture for the fiscal year ended June 30, 1901, was $3,303,500, an increase of $558,920 over the amount appropriated for the preceding year. The total payments from this sum will be, when all accounts shall have been finally settled, about $3,220,000.

Fifteen thousand dollars each for the 48 agricultural experiment stations in the several States was also appropriated.

The supplemental accounts for the years 1899 and 1900, paid during the year, amounted to $255,689.40.

The unexpended balances of the appropriations for the year 1899, amounting to $28,899.27, were covered into the Treasury on June 30, 1901.

During the year 20,677 accounts were received, audited, and paid, as follows: Divisional, 7,124, amounting to $1,219,287; Bureau of Animal Industry, 4,374, amounting to $957,900.42; Weather Bureau, 9,179, amounting to $1,060,139.30; making a total of $3,237,326.72. In payment of these accounts 30,379 checks were drawn on the Treasury at Washington and subtreasuries at New York and Chicago. The number of checks in excess of the number of vouchers is explained by the fact that many of the latter were salary rolls containing from 5 to 100 names each. Only four checks were lost in the mail.

The amount expended for telegraphing and telephoning for the Weather Bureau, including the West Indian cable service, was $183,837.05.

A further extension of the telephone system in the Department at Washington, exclusive of the Weather Bureau, was made during the year. The system now includes 40 regular and 5 auxiliary telephones, and covers practically all the branches of the Department. In addition to this main system, the Bureau of Animal Industry has a special internal system of 16 telephones connecting its several offices and laboratories.

REQUISITIONS, LETTERS, REQUESTS, CONTRACTS, AND LEASES.

To meet the regular expenditures of the Department 107 requisitions were drawn on the Treasury against the various appropriations, amounting to $3,278,702.12.

The number of requisitions for supplies was 6,416.

The number of letters of authority for travel was 2,445.

The number of letters written and received in the regular transaction of business was 34,871.

The number of requests issued for passenger transportation was 2,490.

The number of requests on the Quartermaster-General for transportation of Government property was 2,124.

The number of leases executed and in effect was 135.

The number of contracts for supplies, etc., was 170.

PUBLIC MONEYS RECEIVED FROM VARIOUS SOURCES.

There were received from all sources and deposited in the Treasury to the credit of the proper funds the following sums:

Sale of condemned property	$2,481.32
Sale of Card Index	163.76
Sale of publications, Weather Bureau	174.44
Seacoast telegraph line receipts, Weather Bureau	1,728.49
Sale of American products in Europe	514.96
Total	5,062.97

APPROPRIATIONS, DISBURSEMENTS, AND UNEXPENDED BALANCES.

The following table shows the appropriations, disbursements, and unexpended balances for the year ended June 30, 1901:

Appropriations, disbursements, and amount unexpended for the fiscal year 1901.

Object.	Appropriations, 1901.	Amount disbursed.	Amount unexpended.
Salaries, officers and clerks	$326,680.00	$319,677.35	$7,002.65
Library	5,000.00	2,641.41	2,358.59
Contingent expenses	37,000.00	34,238.54	2,761.46
Animal quarantine stations	50,000.00	39,736.30	10,263.70
Collecting agricultural statistics	110,000.00	103,090.81	6,909.19
Botanical investigations and experiments	30,000.00	27,198.58	2,801.42
Entomological investigations	22,500.00	21,217.94	1,282.06
Vegetable pathological investigations	28,000.00	26,309.57	1,690.43
Biological investigations	17,500.00	16,082.79	1,417.21
Pomological investigations	9,500.00	8,861.36	638.64
Laboratory	28,500.00	26,835.45	1,664.55
Forestry investigations	80,000.00	75,685.49	4,314.51
Experimental gardens and grounds	20,000.00	19,814.43	185.57
Soil investigations	25,000.00	24,690.44	309.56
Grass and forage-plant investigations	17,000.00	13,712.78	3,287.22
Irrigation investigations	50,000.00	41,411.71	8,588.29
Agricultural experiment stations [$780,000] [1]	60,000.00	53,789.87	6,210.13
Nutrition investigations	17,500.00	14,850.15	2,649.85
Arlington experimental farm	10,000.00	9,878.14	121.86
Public-road inquiries	14,000.00	12,619.69	1,380.31
Publications	105,000.00	104,140.26	859.74
Purchase and distribution of valuable seeds	170,000.00	137,753.69	32,246.31
Investigating production of domestic sugar	7,000.00	5,830.73	1,169.27
Tea-culture investigations	5,000.00	4,959.42	40.58
Salaries and expenses, Bureau of Animal Industry	1,000,000.00	877,661.06	122,338.94
Total	2,245,180.00	2,022,687.96	222,492.04
WEATHER BUREAU.			
Salaries	153,320.00	152,688.11	631.89
Fuel, lights, and repairs	9,000.00	8,318.80	681.20
Contingent expenses	8,000.00	7,139.45	860.55
General expenses	828,000.00	387,981.59 328,578.91	518.41
Meteorological observation stations	60,000.00	55,978.86	110,921.09 4,021.14
Total, Weather Bureau	1,058,320.00	940,685.72	117,634.28
Grand total	3,303,500.00	2,963,373.68	340,126.32

[1] Of this amount, $720,000 was paid directly to the experiment stations from the Treasury Department.

ACCOUNTS FOR THE FISCAL YEAR 1899 FINALLY CLOSED.

The accounts for the year ended June 30, 1899, were finally closed on June 30, 1901, and the balances of the various appropriations carried to the surplus fund and turned into the Treasury, on that date, as follows:

Amount of unexpended balances turned into the Treasury.

Object.	Appropriations for 1899.	Amount disbursed.	Amount unexpended.
Salaries, officers and clerks	$319,300.00	$315,986.70	$3,313.30
Furniture, cases, and repairs	9,000.00	8,667.75	332.25
Library	6,000.00	5,659.51	340.49
Museum	1,500.00	1,465.36	34.64
Postage	2,000.00	2,000.00	
Contingent expenses	25,000.00	23,888.08	1,111.92
Animal quarantine stations	12,000.00	11,833.38	166.62
Collecting agricultural statistics	105,000.00	100,952.48	4,047.52
Botanical investigations and experiments	20,000.00	19,972.07	27.93
Entomological investigations	20,000.00	19,812.64	187.36
Vegetable pathological investigations	20,000.00	19,634.32	365.68
Biological investigations	17,500.00	17,373.26	126.74
Pomological investigations	9,500.00	8,248.18	1,251.82
Laboratory	12,400.00	12,028.15	371.85
Forestry investigations	20,000.00	19,520.52	469.48
Experimental gardens and grounds	20,000.00	19,879.66	120.34
Soil investigations	10,000.00	9,885.85	114.15
Grass and forage-plant investigations	10,000.00	9,950.99	49.01
Irrigation information	10,000.00	9,997.49	2.51
Agricultural experiment stations [$760,000][1]	40,000.00	39,536.38	463.62
Nutrition investigations	15,000.00	14,903.08	96.92
Public-road inquiries	8,000.00	7,469.50	530.50
Publications	65,000.00	64,773.62	226.38
Purchase and distribution of valuable seeds	130,000.00	128,350.61	1,649.39
Investigating production of domestic sugar	7,000.00	6,860.30	139.70
Salaries and expenses, Bureau of Animal Industry	900,000.00	[2]920,164.47	6,828.45
Total	1,814,200.00	1,818,824.35	22,368.57
WEATHER BUREAU.			
Salaries	153,340.00	152,597.83	742.17
Fuel, lights, and repairs	8,000.00	7,822.31	177.69
Contingent expenses	8,000.00	7,755.87	244.13
General expenses:			
Salaries	765,162.00	380,950.03	1,244.97
Miscellaneous		380,535.62	2,431.38
Meteorological observation stations	75,000.00	73,316.42	1,683.58
Erection of building at Sault Ste. Marie, Mich	3,000.00	2,994.12	5.88
Repairs to buildings and grounds, Bismarck, N. Dak	3,000.00	2,999.10	.90
Total, Weather Bureau	1,015,502.00	1,008,971.30	6,530.70
Grand total	2,829,702.00	2,827,795.65	28,899.27

[1] Of this amount $720,000 was paid directly to the experiment stations from the Treasury Department.

[2] Includes $26,992.92 received from sale of American products in Europe.

MONTHLY CHECK STATEMENT, SETTLEMENT OF ACCOUNTS, ETC.

The monthly check statements from the Treasury and subtreasuries were received and found to agree with the books of this office. All vouchers were forwarded quarterly to the Treasury, passed upon by the accounting officers, and certified as correct. The annual report to Congress of all expenditures of the Department for the year 1900 was prepared in this office and submitted through the Speaker of the House of Representatives.

ANNUAL SUPPLIES.

Bids for annual supplies were solicited in May in the usual manner, and contracts were made covering nearly all the lines of supplies needed by the Department during the ensuing year at prices varying but slightly from those of the preceding year. All contracts were secured by satisfactory bonds.

CONTRACT FOR SEEDS.

A contract for seeds for Congressional distribution, on account of the $170,000 appropriated for the "Purchase and distribution of valuable seeds, 1901," was awarded to the lowest bidder, The New York Market Gardeners' Association, A. C. Nellis, manager, in the gross sum of $68,874.12, with the privilege of $40,000 additional at prices fixed by said contract.

ESTIMATES OF APPROPRIATIONS.

The estimates of appropriations for the year ending June 30, 1902, were prepared in this office according to the usual practice, and were submitted to Congress through the Secretary of the Treasury, accompanied by an explanation of all changes from the appropriations of the preceding year. The estimates for 1902, including $720,000 for agricultural experiment stations, carried an increase over the appropriations for 1901 of $444,050, and amounted in the aggregate to $4,467,550. The estimates included an item for $200,000 for new laboratory buildings. No appropriation, however, was made for these buildings.

For 1902, Congress appropriated $114,870 more than was estimated for by the Department, as shown in the following table. Of this sum, $100,000 was for seeds for Congressional distribution.

Appropriations and estimates for 1902.

Object.	Amount appropriated for 1902.	Amount estimated for 1902.
Salaries, officers and clerks	$373,820.00	$334,230.00
Library	7,000.00	7,000.00
Contingent expenses	37,000.00	37,000.00
Animal quarantine stations	25,000.00	25,000.00
Collecting agricultural statistics	120,000.00	135,000.00
Botanical investigations and experiments	45,000.00	35,000.00
Entomological investigations	25,500.00	25,000.00
Vegetable pathological investigations	60,000.00	50,000.00
Biological investigations	20,000.00	27,500.00
Pomological investigations	20,000.00	19,500.00
Laboratory	24,500.00	33,500.00
Forestry investigations	146,280.00	180,000.00
Experimental gardens and grounds	20,000.00	25,000.00
Soil investigations	91,000.00	105,000.00
Grass and forage-plant investigations	20,000.00	17,000.00
Irrigation investigations	50,000.00	75,000.00
Agricultural experiment stations [$789,000] [1]	69,000.00	81,000.00
Nutrition investigations	20,000.00	20,000.00
Arlington experimental farm	10,000.00	10,000.00
Plans for building	5,000.00	
Public-road inquiries	20,000.00	20,000.00
Publications, including Farmers' Bulletins	173,000.00	107,500.00
Purchase and distribution of valuable seeds	270,000.00	170,000.00
Investigating production of domestic sugar	5,000.00	7,000.00
Tea-culture investigations	7,000.00	5,000.00
Bureau of Animal Industry	1,050,000.00	1,100,000.00
Total	2,714,100.00	2,651,230.00
WEATHER BUREAU.		
Salaries	159,820.00	155,320.00
Fuel, lights, and repairs	9,000.00	9,000.00
Contingent expenses	8,000.00	8,000.00
General expenses	865,500.00	858,000.00
Meteorological observation stations	60,000.00	60,000.00
Buildings	46,000.00	6,000.00
Total, Weather Bureau	1,148,320.00	1,096,320.00
Grand total	3,862,420.00	3,747,550.00

[1] Of this amount $720,000 is paid directly to the experiment stations from the Treasury Department.

APPROPRIATIONS FOR 1901 AND 1902.

The appropriations for 1901 and 1902 appear in the following table, and it will be seen that there is an increase in favor of the latter year of $558,920:

Appropriations for the years 1901 and 1902.

Object.	Amount appropriated for 1901.	Amount appropriated for 1902.
Salaries, officers and clerks	$326,680.00	$373,820.00
Library	5,000.00	7,000.00
Contingent expenses	37,000.00	37,000.00
Animal quarantine stations	50,000.00	25,000.00
Collecting agricultural statistics	110,000.00	120,000.00
Botanical investigations and experiments	30,000.00	45,000.00
Entomological investigations	22,500.00	25,500.00
Vegetable pathological investigations	28,000.00	60,000.00
Biological investigations	17,500.00	20,000.00
Pomological investigations	9,500.00	20,000.00
Laboratory	28,500.00	24,500.00
Forestry investigations	80,000.00	146,280.00
Experimental gardens and grounds	20,000.00	20,000.00
Soil investigations	25,000.00	91,000.00
Plans for administrative building		5,000.00
Grass and forage-plant investigations	17,000.00	20,000.00
Irrigation investigations	50,000.00	50,000.00
Agricultural experiment stations [$780,000] [1]	60,000.00	69,000.00
Nutrition investigations	17,500.00	20,000.00
Arlington experimental farm	10,000.00	10,000.00
Public-road inquiries	14,000.00	20,000.00
Publications, Farmers' Bulletins	105,000.00	173,000.00
Purchase and distribution of valuable seeds	170,000.00	270,000.00
Investigating production of domestic sugar	7,000.00	5,000.00
Tea-culture investigations	5,000.00	7,000.00
Salaries and expenses, Bureau of Animal Industry	1,000,000.00	1,050,000.00
Total	2,245,180.00	2,714,100.00
WEATHER BUREAU.		
Salaries	153,320.00	159,820.00
Fuel, lights, and repairs	9,000.00	9,000.00
Contingent expenses	8,000.00	8,000.00
General expenses	828,000.00	865,500.00
New buildings at stations		46,000.00
Meteorological observation stations	60,000.00	60,000.00
Total, Weather Bureau	1,058,320.00	1,148,320.00
Grand total	3,303,500.00	3,862,420.00

[1] The total appropriations under this head are $780,000 and $789,000 for the years given, respectively, but $720,000 of each appropriation is paid directly to the experiment stations from the Treasury Department. The sums included in the figure columns represent only the amount available for departmental expenditures.

NEW BUREAUS.

Four new bureaus were created by the appropriation act for the year 1902 by raising to that grade certain scientific Divisions of the Department, as follows:

Bureau of Plant Industry, which includes what were formerly the Divisions of Vegetable Physiology and Pathology, Botany, Pomology, Agrostology, and Experimental Gardens and Grounds.

Bureau of Forestry, which is to include forestry work in the United States.

Bureau of Soils, for the investigation of soil problems, including the mapping of tobacco soils.

Bureau of Chemistry, for the investigation of food adulteration, food preservatives, etc.

The several amounts appropriated for these Bureaus are divided as follows:

Appropriations for the new Bureaus.

Bureau.	Salaries.	General expenses.	Total.
Bureau of Plant Industry	$39,680	$165,000	$204,680
Bureau of Forestry	39,160	146,280	185,440
Bureau of Soils	18,140	91,000	109,140
Bureau of Chemistry	11,300	24,500	35,800

A salary of $3,000 each is provided for the chiefs of these Bureaus, with assistants at $2,500 each. The question of salaries for the scientific corps of the Department of Agriculture has been a matter of consideration by the Committee on Agriculture for several years past.

NEW BUILDINGS AT WEATHER BUREAU STATIONS.

The Weather Bureau appropriations were increased by $90,000 for 1902 for the purpose of establishing new stations, erecting new buildings where needed, a new cable to Tatoosh Island, State of Washington, for the circulation of daily weather reports by the newly established rural free-delivery routes, and for the installation and operation of a system of wireless communication between the mainland and Tatoosh Island. Of this sum, $26,000 is intended for the purchase of a site and the erection of a small brick and wood building at each of the following-named places, for the use of the Weather Bureau, and for all necessary labor, materials, and expenses, plans and specifications, and for the purchase of instruments, furniture, supplies, storm-warning towers, etc., to properly equip the same:

Appropriations for new Weather Bureau stations.

Atlantic City, N. J	$6,000
Hatteras, N. C	5,000
Fort Canby, Wash	4,000
Port Crescent, Wash	3,000
Tatoosh Island, Wash	5,000
Point Reyes, Cal	3,000
Total	26,000

PLANS FOR NEW ADMINISTRATIVE BUILDING.

The sum of $5,000 is appropriated "to enable the Secretary of Agriculture to have prepared, under his direction, plans for a fireproof administrative building, to be erected on the grounds of the Department of Agriculture, in the city of Washington, said plans, and such recommendations thereon as the Secretary of Agriculture may deem necessary, to be transmitted to Congress at its next regular session." This is the first decided and substantial step in the direction of a new administrative building, and is the result of persistent and determined efforts by the Department for many years past. The Committees on Agriculture and on Appropriations are favorably disposed toward an appropriation for this purpose, fully realizing its importance, and a very friendly feeling exists among Members of Congress generally, the necessity for a new building being well understood.

RENT OF ADDITIONAL BUILDINGS.

Two thousand dollars is provided for the payment of rent for the ensuing year for the Bureau of Forestry, the accommodations in the main building being wholly inadequate to the needs of the Bureau. In this connection all of the seventh floor and part of the eighth floor of the Atlantic Building, 908 F street NW., was leased on July 1, 1901, at an annual rental of $2,000, and the Bureau force has been installed therein, together with all office fixtures and furniture.

The appropriation for the Division of Publications carries $2,500 "for the rent of a building and for such alterations as may be needed, for the storage of publications." The Department has arranged with the owner of ground on B street, between Thirteenth and Thirteen-and-a-half streets SW., who is now erecting a large, double brick building, which is to be completed at an early date, and will be leased by the Department for a period of years, subject to an annual appropriation by Congress for rental. The building will be arranged expressly to accommodate the work of the Division of Publications in the storing and handling of publications.

These sums added to the amounts paid for other private property already under lease will make for rental in the District of Columbia, for the year ending June 30, 1902, over $10,000.

LAW CLERK.

In the estimates for this Department for the fiscal year ended June 30, 1897, one "law clerk" was provided for at an annual salary of $2,200. The recommendation failed to receive the approval of Congress, and no further effort has been made in that direction. Since then, however, on account of the urgent necessity for legal advice, a third-class clerk on the roll of the Secretary has been detailed to act as law clerk, and assigned to duty in the Division of Accounts and Disbursements. Although not a regular graduate, this clerk has a fair knowledge of law, especially departmental, and has performed the duties of the trying position very acceptably.

The legal work of the Department has increased enormously during the past two or three years, while the importance and serious character of the questions involved require the most careful and expert consideration. The amount and importance of the work will continue to increase with the growth and development of the Department; in fact the work has already grown to such proportions that the services of an assistant law clerk could be utilized not only to advantage, but will shortly become an actual necessity. This is the only Department of the Government without a statutory roll for legal experts, and it is earnestly recommended that a law clerk be included in the estimates of this Department for the next fiscal year.

REVISED EDITION OF THE FISCAL REGULATIONS.

A revised edition of the "Fiscal regulations of the Department" was issued on July 1, 1901. This edition includes all amendments made necessary by recent rulings of the Comptroller of the Treasury; it also includes certain modifications of the rules of the Department governing field expenses, etc. Among other changes $5 is allowed for daily subsistence instead of $4, as formerly. Laundry expenses are also allowed when the travel extends beyond one week.

REPEAL OF ACT PROHIBITING ADDITIONAL COMPENSATION.

The act approved March 3, 1885, relating to additional compensation to employees of the Department of Agriculture, has a very important bearing upon the work of the Department, and it is thought proper to include in this report a letter from the Secretary of Agriculture on the subject, to the chairman of the Senate Committee on Agriculture and Forestry, as this letter fully explains the situation as affected by the act. The repeal of this section was approved by the House Committee on Agriculture and the Senate Committee on Agriculture and Forestry at the last session of Congress. The repealing clause, as recommended in the Secretary's letter to Senator Proctor, had the expressed approval and support of both committees, and appeared as an amendment to the Senate bill, but for some reason the amendment was stricken from the bill in the committee on conference. It is hoped that the objectionable section may be unconditionally repealed at the next session of Congress. The letter is as follows:

DEPARTMENT OF AGRICULTURE,
OFFICE OF THE SECRETARY,
Washington, D. C., January 17, 1901.

Hon. REDFIELD PROCTOR,
Chairman Committee on Agriculture and Forestry, United States Senate.

SIR: In making the appropriation for this Department for the fiscal year 1886 (act approved March 3, 1885, 23 Statutes at Large, 353–356), Congress saw proper to enact a section worded as follows:

"SEC. 2. That no part of the money herein or hereafter appropriated for the Department of Agriculture shall be paid to any person, as additional salary or compensation, receiving at the same time other compensation as an officer or employee of the Government; and in addition to the proper vouchers and accounts for the sums appropriated for the said Department, to be furnished to the accounting officers of the Treasury, the Commissioner of Agriculture shall at the commencement of such regular session present to Congress a detailed statement of the expenditure of all appropriations for said Department for the last preceding fiscal year."

The effect of this enactment was to impose upon this Department restrictions and duties from which other Departments have remained free. I am advised that the foregoing restriction upon the use of the appropriations for this Department was imposed because a former official had somehow managed to receive compensation from the Government from three different sources. The restriction was not then, and has not been since, imposed upon the other Executive Departments, presumably because Congress is not aware of any necessity for such legislation.

The singling out of this one Department (which was at that time a much less important establishment than it is at present) and the maintenance of this distinction down to this time may justly be looked upon as a reflection upon the official management of the business of the Department of Agriculture. The distinction should be obliterated, either by imposing it upon other Departments, or by relieving this Department from the necessity of observing it. The public interests do not appear to require it. Other Departments do not suffer from lack of the protection it was supposed to afford. On the other hand, it does most seriously militate against the interests of this Department by prohibiting the employment of technical experts who happen to be connected with other branches of the Government for special service in this Department. It renders it impossible for this Department to utilize, even in the smallest way, the service of many of the ablest specialists in the country. It inflicts a heavy burden upon the Disbursing Officer, who is thus compelled to maintain a constant watch over the entire public service; and in spite of the utmost care it is not always possible for him to avoid actual losses. Indeed, it would seem to impose upon him the necessity of being always provided with the names of all the employees of the Government, not only in Washington, but elsewhere throughout the country, and his list would need to be, at all times, kept corrected to date. This is manifestly an impossibility.

I therefore recommend the immediate and unconditional repeal of the clause imposing the restriction herein referred to.

With respect to the second clause of the section above quoted, I would respect-

fully suggest that I know of no reason why this Department should be required to furnish detailed statements of expenditures not required by the general statutes of all the Executive Departments. Not only, however, does the section referred to require every year "a detailed statement of the expenditure of all appropriations" for this Department, but section 11, of the act of Congress approved May 29, 1884, establishing the Bureau of Animal Industry, also requires "an itemized statement of all expenditures under that act." Thus a duplication of a considerable part of this work is made necessary.

I inclose herewith a copy of the statement of the expenditures (House Doc. No. 173, Fifty-sixth Congress) for 1899. It is a document of 234 pages. The cost of its preparation and publication amounts to several hundred dollars. Its value is exceedingly doubtful. Certainly the time of the clerks engaged upon it might be better employed upon other work, and the cost of printing it could be better used in issuing some bulletin of real value to the agricultural interests of the country.

I should not like to be understood as wishing to be relieved of any duty properly imposed by Congress on all the Departments alike. Neither would I seek to avoid any special burden imposed upon this Department if the conditions in this Department differed in any material respect from those existing in other Departments. But I would respectfully suggest that, unless there be some good reason for requiring the detailed statements called for by the section I have quoted, that the requirement be no longer continued.

I therefore respectfully recommend that in the pending bill making appropriations for this Department for the fiscal year ending June 30, 1902, a clause be inserted, or added, in substance as follows:

"That section 2 of the act approved March 3, 1885, chapter 338, Forty-eighth Congress, Session II, imposing restrictions and duties upon the Department of Agriculture not imposed upon the other Executive Departments, be, and the same is hereby, repealed."

I have the honor to be, sir, very respectfully, your obedient servant,

JAMES WILSON, *Secretary.*

IMMEDIATELY AVAILABLE APPROPRIATIONS.

Forty-seven thousand dollars of the appropriations for 1902 was made "immediately available," divided among certain funds, as shown in the following statement. The question of making a part of an appropriation immediately available is assuming a serious aspect. The practice is contrary to the avowed policy of the Department and should not only be discouraged but totally discontinued. During the last two or three years there has developed a decided and growing tendency in that direction. In practically every instance an immediately available appropriation is in the nature of a deficiency to the appropriation of the preceding year, the only difference being in the fact that the amount of the deficiency is carried in the annual appropriation bill instead of in the regular deficiency bill.

Amounts immediately available.

Grass and forage-plant investigations	$5,000
Bureau of Soils	10,000
Bureau of Chemistry	5,000
Collecting agricultural statistics	3,000
Biological Survey	1,000
Publications	8,000
Tea culture	2,000
Agricultural experiment stations	3,000
Purchase and distribution of valuable seeds	5,000
Plans for building	5,000
Total	47,000

LEASED BUILDINGS, WITH LOCATION AND MONTHLY AND ANNUAL RENTAL.

In the District of Columbia.—The following is a statement of the location, annual rental, and use of the several buildings under lease by the Department in the District of Columbia during the year ended June 30, 1901:

No. 1362 B street SW., Bureau of Animal Industry laboratory	$1,800
No. 1358 B street SW., Division of Botany laboratory	720
No. 1364 B street SW., Division of Chemistry laboratory	2,500
No. 212 Thirteenth street SW., Division of Vegetable Physiology and Pathology laboratory	660
No. 214 Thirteenth street SW., Division of Soils laboratory	660
Total	6,340

Outside the District of Columbia.—The following are the Bureau of Animal Industry, Division of Botany, and Weather Bureau stations under lease by the Department outside of the District of Columbia during the year ended June 30, 1901:

BUREAU OF ANIMAL INDUSTRY.

Stations, with location and monthly or annual rental.

Station.	Location.	Rent.
Baltimore, Md	No. 215 St. Paul street	$125 per annum.
Boston, Mass	No. 44 Kilby street	$30 per month.
Buffalo, N. Y	East Buffalo Live Stock Exchange Building	Do.
Chicago, Ill	No. 4193 South Halsted street	$225 per month.
Do	Union Stock Yards, Center and Exchange avenues.	$75 per month.
Garfield, N. J	(Quarantine station)	$1,800 per annum.
Indianapolis, Ind	35 Live Stock Exchange Building	$10 per month.
Kansas City, Kans	Corner Central and James streets	$45 per month.
Do	Live Stock Exchange Building	$16.50 per month.
Littleton, Mass	(Quarantine station)	$250 per annum.
Louisville, Ky	No. 507 Johnson street	$10 per month.
National Stock Yards, Ill	Live Stock Exchange Building	$50 per month.
New York, N. Y	No. 18 Broadway	$500 per annum.
Do	No. 109 West Forty-second street	$40 per month.
Norfolk, Va	No. 70 Plume street	$210 per annum.
San Francisco, Cal	87 Flood Building	$20 per month.
South St. Joseph, Mo	St. Joseph Stock Yard Company Building	$45 per month.
St. Denis, Md	(Quarantine station)	$225 per annum.
Cheyenne, Wyo	Warren Block, Sixteenth street	$45 per month.
Cincinnati, Ohio	Exchange Building, Jackson street	$180 per annum.
Milwaukee, Wis	Gross Building	$17 per month.
Knoxville, Tenn	The Deaderick Building	$10 per month.

DIVISION OF BOTANY.

Kensington, Md		$50 per annum.

Stations, with location and annual rental, including such items as heat, light, janitor, ice, brooms, matches, etc.

No.	Station.	Location.	Rent.	
			Amount.	Includes—
	UNITED STATES STATIONS.			
1	Abilene, Tex	On South First street	a $424.45	Heat, cleaner, oil, matches, ink, mucilage, brooms, ice, and water.
2	Albany, N. Y	In public building, corner Broadway and State street		
3	Alpena, Mich	Corner Fletcher and Dock streets	a 211.36	Heat, cleaner, light, oil, matches, ink, and mucilage.
4	Amarillo, Tex	Corner Polk and Fifth streets	a 120.00	
5	Astoria, Oregon	No. 545 Commercial street	a 252.00	Heat, cleaner, light, oil, matches, ink, mucilage, brooms, and ice.
6	Atlanta, Ga	In Prudential Building, corner Broad, Walton, and Forsyth streets.	a 900.00	Heat, cleaner, light, and ice water.
7	Atlantic City, N. J	In Real Estate and Law Building, 1421 Atlantic avenue.	a 360.00	Heat and janitor service.
8	Augusta, Ga	In public building, corner Campbell and Greene streets.		
9	Baker City, Oregon	In Pollman Building, Main street	a 350.00	Heat, cleaner, light, matches, ink, mucilage, brooms, ice, water, and soap.
10	Baltimore, Md	Johns Hopkins University, 532 North Howard street		
11	Binghamton, N. Y	In public building, corner Wall and Henry streets		
12	Birmingham, Ala	In Walker & Jordan Building, 2011 First avenue	b 120.00	Electric light and telephone.
13	Bismarck, N. Dak	In public building, corner Main and First streets		
14	Block Island, R. I	On Main street	a 259.97	Heat, cleaner, light, oil, matches, ink, mucilage, brooms, ice, and use of cellar.
		On cupola of National Hotel, on Main street	b 20.00	For exposure of wind instruments.
15	Boise, Idaho	In Sonna Building, No. 228 Main street	a 480.00	Heat, janitor service, light, hot and cold water.
16	Boston, Mass	In public building, Post-Office square		
17	Buffalo, N. Y	In Prudential Building, corner Pearl and Church streets.	a 539.85	Heat, cleaner, light, matches, ink, mucilage, brooms, ice, electric current for motor of printing press.
18	Buxton, N. C	Near Buxton, Dare County, N. C	b 40.00	Rent of ground.
19	Cairo, Ill	In public building, corner Washington avenue and Fourteenth street.		
20	Cape Henry, Va	In Weather Bureau Building, on the beach		
21	Cape May, N. J	No. 510 Hughes street	a 420.00	Heat, cleaner, and light.
22	Carson City, Nev	In public building, on Carson street		
23	Charleston, S. C	In public building, 200 East Bay street		
24	Charlotte, N. C	In public building, corner Trade and Mint streets		
25	Chattanooga, Tenn	In public building, corner Eleventh and A streets		
26	Cheyenne, Wyo	In Commercial Building, 216–218 West Sixteenth street	a 517.61	Heat, cleaner, light, matches, ink, mucilage, brooms, ice, water, and soap.

a In accordance with existing lease. b Under written agreement, lease being impracticable.

Stations, with location and annual rental, including such items as heat, light, janitor, ice, brooms, matches, etc.—Continued.

No.	Station.	Location.	Rent.	
			Amount.	Includes—
	UNITED STATES STATIONS—continued.			
27	Chicago, Ill	Auditorium Building, corner Wabash avenue and Congress street.	a $1,800.00	Heat, cleaner, light, oil, matches, ink, mucilage, ice, water, soap, and elevator.
28	Cincinnati, Ohio	In public building, Fifth street between Walnut and Main streets.		
29	Cleveland, Ohio	In Society for Savings Building, corner Public Square and Ontario streets.	a 1,140.00	Heat, cleaner, light, oil, matches, ink, mucilage, brooms, ice, water, toilet supplies, power for electric motor, gas for stereotyping, electricity for signals, and storeroom.
30	Columbia, Mo	In Agricultural College Building, campus State University.		
31	Columbia, S. C	In City Hall, northwest corner Main and Gervis streets	a 360.00	Heat, cleaner, and light.
32	Columbus, Ohio	In Eberly Block, 203–215 South High street	a 616.00	Heat, cleaner, light, oil, matches, ink, mucilage, brooms, ice water, washing towels and flags, rent of telephone, gas for stereotyping, electric power for press, and district messenger service (mail to and from post office).
33	Concordia, Kans	Post-office building, 204 Sixth street	a 292.00	Heat, cleaner, light, matches, and ice.
34	Corpus Christi, Tex	In Hatch and Robertson Building, corner Mesquite and Peoples streets.	a 259.00	Heat, cleaner, and light.
35	Currituck Inlet, N. C	In United States Life Saving Station Building		
36	Davenport, Iowa	In public building, corner Fourth and Perry streets		
37	Denver, Colo	In public building, corner Sixteenth and Arapahoe streets.		
38	Des Moines, Iowa	In public building, corner Fifth street and Court avenue.		
39	Detroit, Mich	Union Trust Building, corner Griswold and Congress streets.	a 670.00	Heat, cleaner, electric light and power, oil, matches, ink, mucilage, brooms, ice, water, soap, and elevator.
40	Dodge, Kans	Beeson Block, on Front street	a 355.65	Heat, cleaner, light, matches, ink, mucilage, brooms, ice, water, soap, brushes, stove polish, and lavatory.
41	Dubuque, Iowa	In Bank and Insurance Building, corner Main and Ninth streets.	a 400.00	Heat, cleaner, light, and water.
42	Duluth, Minn	In public building, First street and Fifth avenue, west		
43	Eagle, Alaska	Corner Front street and Columbus avenue	a 700.00	Heat, cleaner, and light.
44	East Clallam, Wash	In telegraph office, Frontier street		
45	Eastport, Me	In public building, corner Water and Washington streets.		
46	Elkins, W. Va	In Warfield & Dann Building, corner Third street and Davis avenue.	a 300.00	Heat, cleaner, washing towels, light, oil, matches, ice, and water.
47	El Paso, Tex	In public building, St. Louis and Oregon streets		
48	Erie, Pa	In public building, Park Row and State street		
49	Escanaba, Mich	In Semer Block, corner Ludington street and Harrison avenue.	a 456.00	Heat, cleaner, light, oil, matches, ink, mucilage, brooms, ice, water, and soap.

50	Eureka, Cal	In Buhne's brick building, corner Second and G streets.	a 375.00	Heat, cleaner, light, oil, matches, ink, mucilage, brooms, and water.
51	Evansville, Ind	In Federal Building, Second street between Vine and Sycamore streets.		
52	Flagstaff, Ariz	In Milligan Cottage, corner Aspen avenue and Park street.	a 600.00	Heat, cleaner, light, and ice.
53	Fort Smith, Ark	In public building, on Sixth street		
54	Fort Worth, Tex	In public building, corner Jennings avenue and Texas street.		
55	Fresno, Cal	Farmers' National Bank of Fresno Building, No. 1056 I street.	a 460.00	Heat, cleaner, light, oil, matches, ink, mucilage, brooms, ice, mops, and telephone service.
56	Galveston, Tex	In Improvement, Loan and Trust Building, 2222 Post-Office street.	a 600.00	Heat, cleaner, light, water, elevator, brooms, ice, and soap.
57	Grand Haven, Mich	Cutler House, corner Third and Washington streets	a 237.29	Heat, cleaner, light, oil, matches, ink, mucilage, and brooms.
58	Grand Junction, Colo	In Canon Block, corner Fourth and Main streets	a 480.00	Heat, janitor service, light, oil, matches, water, soap, and towels.
59	Green Bay, Wis	In Parmentier Block, 324-328 Washington street	a 300.00	Heat, cleaner, light for office and storm warnings, matches, ink, mucilage, brooms, and soap.
60	Hannibal, Mo	In public building, corner Broadway and Sixth street		
61	Harrisburg, Pa	In public building, corner Third and Walnut streets		
62	Hatteras, N. C	In Styron's House, main road	a 154.50	Heat, cleaner, light, oil, matches, ink, mucilage, brooms, and soap.
63	Havre, Mont	In Gussenhoven Building, First street, between Third and Fourth avenues.	a 360.00	Heat, cleaner, light, matches, brooms, ice, and water.
64	Helena, Mont	In Power Block, corner Main street and Sixth avenue.	a 588.00	Heat, cleaner, and light.
65	Houghton, Mich	In Shelden Building, northwest corner Shelden and Isle Royale streets.	a 375.00	Heat, hot and cold water.
66	Huron, S. Dak	In Jeffris Block, 337 Dakota avenue	a 400.00	Heat, cleaner, light, matches, ink, mucilage, brooms, ice, soap, and water closet.
67	Independence, Cal	In Norman House, corner Market and Edward streets.	a 270.00	Heat, cleaner, light, matches, and water.
68	Indianapolis, Ind	In Majestic Building, corner Pennsylvania and Maryland streets.	a 1,000.00	Heat, cleaner, light, oil, matches, ink, mucilage, brooms, and ice.
69	Ithaca, N. Y	In Lincoln Hall, Cornell University		
70	Jacksonville, Fla	In Astor Building, 128 west Bay street	a 558.00	Heat, cleaner, and light.
71	Jupiter, Fla	In Weather Bureau Building near light-house		
72	Kalispell, Mont	In Conrad National Bank Building, corner Main and Second streets.	a 270.00	Heat, light, and janitor service.
73	Kansas City, Mo	In Rialto Building, corner Grand avenue and Ninth street.	a 660.00	Heat, cleaner, light, brooms, ice water, and water.
74	Keokuk, Iowa	In public building, corner Seventh and Blendeau streets.		
75	Key West, Fla	In Waite Building, corner Duval and Wall streets	a 479.30	Cleaner, light, oil, matches, ink, mucilage, brooms, ice, and water.
76	Kittyhawk, N. C	In Weather Bureau Building, on the beach		
77	Knoxville, Tenn	University of Tennessee		
78	La Crosse, Wis	In public building, corner Fourth and State streets		
79	Lander, Wyo	In Bunce & Iiam's Block, No. 36 Main street	a 360.00	Heat, cleaner, light, matches, brooms, and ice.
80	Lansing, Mich	In Federal Building, corner Michigan and Capitol avenues.		
81	Lewiston, Idaho	In Dent and Butler Building, 319 E street	a 420.00	Heat, light, water, use of toilet, washstand, use of roof, and janitor service.

a In accordance with existing lease.

Stations, with location and annual rental, including such items as heat, light, janitor, ice, brooms. matches, etc.—Continued.

No.	Station.	Location.	Rent.	
			Amount.	Includes—
	UNITED STATES STATIONS—continued.			
82	Lexington, Ky	In State College Building, South Limestone street	----------	
83	Lincoln, Nebr	In University of Nebraska Building, corner Twelfth and T streets.	----------	
84	Little Rock, Ark	In public building, on Second street between Center and Spring.	----------	
85	Los Angeles, Cal	In Wilson Building, 102½ South Spring street	*a* $563.30	Heat, cleaner, light, matches, ink, mucilage, brooms, ice, and water.
86	Louisville, Ky	In public building, corner Fourth and Chestnut streets.	----------	
87	Lynchburg, Va	In Law Building, 807 Main street	*a* 270.00	Heat, cleaner, light, matches, ink, mucilage, brooms, ice, water, and soap.
88	Macon, Ga	In public building, corner Third and Mulberry streets.	----------	
89	Manteo, N. C	At Weirs Point, near Manteo, N. C.	*b* 40.00	Rent of ground.
		In Hotel Roanoke	*b* 93.00	Heat, cleaner, light, oil, matches, brooms, ice, soap, and water.
90	Marquette, Mich	In Marquette County Savings Bank, southeast corner Washington and Front streets.	*a* 360.00	Heat and water.
91	Memphis, Tenn	In Porter Building, corner Main and South Court streets.	*a* 600.00	Heat, cleaner, light, water, and elevator.
92	Meridian, Miss	In public building corner Twenty-second avenue and Eighth street.	----------	
93	Miles City, Mont	In Leighton Building, on Main street	*a* 168.00	Heat, light, oil, matches, ink, mucilage, brooms, and ice.
94	Milwaukee, Wis	In public building, Wisconsin street, between Jefferson and Jackson streets.	----------	
95	Minneapolis, Minn	In public building, corner Third street and First avenue, south.	----------	
96	Mobile, Ala	In public building, corner St. Francis and Royal streets.	----------	
97	Modena, Utah	In Utah and Pacific Railroad depot	*a* 180.00	Heat, cleaner, light, matches, brooms, and exposure for instruments.
98	Montgomery, Ala	In public building, corner Lawrence street and Dexter avenue.	----------	
99	Moorhead, Minn	In First National Bank, corner Front and Sixth streets.	*a* 265.25	Heat, cleaner, light for office, matches, ink, mucilage, brooms, ice, water, and soap.
100	Mount Tamalpais, Cal	In observatory building, eastern peak Mount Tamalpais.	*a* 420.00	Heat, light, oil, matches, ink, mucilage, brooms, water, and transportation for employees and supplies.
101	Mount Washington, N. H	On summit	*a* 5.00	For rent of ground on which Weather Bureau Building is located.
102	Nantucket, Mass	In Pacific Club House, corner Main and Water streets	*a* 270.00	Heat, light, ink, mucilage, brooms, ice, water, and electric light for signals.

103	Narragansett Pier, R. I	In Odlen Cottage, Kingstown street	a 150.96	Heat, light, matches, ink, mucilage, and brooms.
104	Nashville, Tenn	In Chamber of Commerce, No. 309 Church street	b 496.00	Heat, cleaner, light, matches, ink, mucilage, brooms, ice, and soap.
105	Neah Bay, Wash	In Indian agency building, facing bay		
106	New Brunswick, N. J	In New Jersey experiment station building, corner Bleecker place and Hamilton street.		
107	New Haven, Conn	In Insurance Building, No. 890 Chapel street	a 384.00	Heat, cleaner, and light.
108	New Orleans, La	In public building, corner Decatur and Customhouse streets.		
109	New York, N. Y	In American Surety Building, 100 Broadway	a 2,500.00	Heat, cleaner, light for office and signals, electricity or gas for stereotyping, electric current for printing press, use of flagstaff, elevators, roof, and storage for property.
110	Norfolk, Va	In Citizens' Bank Building, 191–195 Main street	a 525.00	Heat, cleaner, light, ice, and water.
111	Northfield, Vt	In Norwich University, on Central street		
112	North Platte, Nebr	In Odd Fellows' Hall, corner Fifth and Dewey streets.	a 339.50	Heat, cleaner, light, matches, ink, mucilage, brooms, ice, and soap.
113	Oklahoma, Okla	In Opera House Block, corner Robinson street and Grand avenue.	a 510.00	Heat, cleaner, light, ink, mucilage, brooms, ice, and water.
114	Omaha, Nebr	In public building, corner Sixteenth and Dodge streets.		
115	Oswego, N. Y	In public building, Oneida street		
116	Palestine, Tex	In City Hall, corner of Palmer and Oak streets	a 314.00	Heat, cleaner, light, oil, matches, ink, mucilage, brooms, ice, water, and soap.
117	Parkersburg, W. Va	In public building, corner Fifth and Juliana streets		
118	Pensacola, Fla	In public building, corner Palafox and Government streets.		
119	Phoenix, Ariz	In Wharton Building, No. 38 North Center street	a 300.00	
120	Philadelphia, Pa	In public building, corner Ninth and Chestnut streets.		
121	Pierre, S. Dak	In Geiger's Block, Pierre street, near Dakota avenue.	a 240.00	Heat, light, matches, ink, mucilage, brooms, ice, water, and soap.
122	Pittsburg, Pa	In public building, Smithfield street, Third to Fourth avenues.		
123	Pocatello, Idaho	In Cook Building	360.00	Heat, cleaner, light, and water.
124	Point Reyes Light, Cal	In light-house building		
125	Port Crescent, Wash	In Hart Building, corner Third and A streets	a 96.00	
126	Port Huron, Mich	In Federal Building, corner Sixth and Water streets.		
127	Portland, Me	First National Bank, 57 Exchange street	a 504.00	Heat, cleaner, light, oil, matches, ink, mucilage, brooms, ice, and soap.
128	Portland, Oregon	In Oregonian Building, corner Sixth and Alder streets.	b 840.00	Heat, cleaner, light, and water.
129	Pueblo, Colo	In public building, corner Sixth and Main streets		
130	Raleigh, N. C	In Fisher Building, corner Fayetteville street and Exchange place.	a 240.00	Water rent for water-closet.
131	Rapid City, S. Dak	In Lakota Building, corner Seventh and St. Joe streets.	a 276.00	Heat, cleaner, light, oil, matches, ink, mucilage, brooms, ice, water, soap, brushes, dusters, and towels.
132	Red Bluff, Cal	In Bank of Tehama County, Cal., corner of Main and Walnut streets.	a 396.25	Heat, cleaner, light, oil, matches, ink, mucilage, brooms, ice, and soap.
133	Richmond, Va	In Times Building, corner Bank and Tenth streets	a 600.00	Heat, cleaner, light, water, elevator, electric power for press, and gas for stereotyping furnace.
134	Rochester, N. Y	In public building, corner Church and Fitzhugh streets.		

a In accordance with existing lease.

b Under written agreement, lease being impracticable.

Stations, with location and annual rental, including such items as heat, light, janitor, ice, brooms, matches, etc.—Continued.

No.	Station.	Location.	Rent. Amount.	Rent. Includes—
	UNITED STATES STATIONS—continued.			
135	Roseburg, Oregon	In Marks Building, 228½ Jackson street	a $309.00	Heat, cleaner, light, oil, matches, ink, mucilage, brooms, water, soap and chimneys.
136	Sacramento, Cal	In public building, corner Seventh and K streets		
137	St. Louis, Mo	In public building, on Olive street, between Eighth and Ninth.		
138	St. Paul, Minn	In Chamber of Commerce Building, 112 East Sixth street.	a 372.85	Heat, cleaner, light, oil, matches, ink, mucilage, brooms, ice, soap, and chimneys.
139	Salt Lake City, Utah	In Dooly Block, corner West Temple and Second South streets.	a 600.00	Heat, cleaner, light, matches, brooms, water, and elevator.
140	San Antonio, Tex	In Hicks Building, corner Avenue C and East Houston street.	a 480.00	Heat, cleaner, and water.
141	San Diego, Cal	In Keating Building, corner Fifth and F streets	a 360.00	Heat, cleaner, light, matches, ink, mucilage, brooms, and ice.
142	Sandusky, Ohio	In public building, corner Columbus avenue and Market street.		
143	San Francisco, Cal	In Mills Building, corner Bush and Montgomery streets.	a 1,290.00	Heat, cleaner, light, water, electric power for printing press, and gas for stereotyping.
144	San Luis Obispo, Cal	In Rackliffe Building, corner Choro and Marsh streets	a 300.00	Heat, cleaner, light, matches, ink, mucilage, brooms, ice, water, and soap.
145	Santa Fe, N. Mex	In Catron Building, corner Plaza on Palace avenue	a 420.00	Heat, light, and water.
146	Sault Ste. Marie, Mich	In Weather Bureau Building on Government reservation known as "Canal grounds."		
147	Savannah, Ga	In public building, corner President and Whitaker streets.		
148	Scranton, Pa	In Connell Building, 127 Washington avenue	a 475.00	Heat, cleaner, and light.
149	Seattle, Wash	In New York Building, No. 704 Second avenue	a 480.00	Heat, cleaner, light, and water.
150	Shreveport, La	In public building, corner Texas and Marshall streets		
151	Sioux City, Iowa	In public building, corner Sixth and Douglas streets		
152	Spokane, Wash	In Jamieson Building, 705 Riverside avenue	a 540.00	Heat, cleaner, light, and water.
153	Springfield, Ill	In public building, corner Monroe and Sixth streets		
154	Springfield, Mo	In public building, corner Booneville and Brower streets.		
155	Tacoma, Wash	In Chamber of Commerce Building, corner C and Ninth streets.	a 240.00	Heat, cleaner, and light.
156	Tampa, Fla	In Knight Building, No. 315½ Franklin street	a 328.75	Heat, cleaner, light, matches, ink, mucilage, and ice.
157	Toledo, Ohio	In public building, corner Madison and St. Clair streets		
158	Topeka, Kans	In Columbia Building, 112 west Sixth avenue	a 350.00	Heat, cleaner, light, ink, mucilage, brooms, ice, and water.
159	Twin, Wash	In Jones Building	a 100.00	
160	Valentine, Nebr	In Davenport Building, corner Catherine and Main streets.	a 400.00	Heat, cleaner, light, oil, matches, and brooms.

161	Vicksburg, Miss	In public building, corner Crawford and Walnut streets.		
162	Walla Walla, Wash	In Paine Brothers' Building, corner Main and Second streets.	a 295.80	Heat, cleaner, brooms, and soap.
163	Wichita, Kans	In The Sedgwick, corner First and Market streets	a 350.00	Heat, cleaner, light, oil, matches, ink, mucilage, brooms, ice, and soap.
164	Williston, N. Dak	Corner Main and Third streets	a 350.00	Heat, cleaner, and light.
165	Wilmington, N. C	In public building, corner Front and Chestnut streets.		
166	Winnemucca, Nev	In county court-house, on Bridge street	a 268.00	Heat, cleaner, light, matches, ink, mucilage, brooms, and water.
167	Yankton, S. Dak	In Union Block, corner Third and Walnut streets	a 280.00	Heat, cleaner, and light.
168	Yuma, Ariz	In public building, on Government reservation		
	Total		42,209.64	
	WEST INDIAN STATIONS.			
169	Basseterre, St. Kitts	In American House, Liverpool row	b 288.00	Observatory platform and storage.
170	Bridgetown, Barbados	In ice house, corner McGregor and Broad streets	b 352.00	Cleaner, light, oil, matches, ink, mucilage, brooms, ice, water, soap, and towels.
171	Cienfuegos, Cuba	In Union Hotel, No. 19 D'Clouet street, corner San Fernando.	b 480.00	Janitor, light, water, washing towels, and use of roof.
172	Havana, Cuba	At No. 67 Prado, Belots Baths	b 1,200.00	Cleaner, light, water, and soap.
		In Hacienda, between Obispo and Obripia streets		
173	Kingston, Jamaica	Halfway Tree, 3 miles north of Kingston	b 438.00	Water rates, taxes, and exposure instruments.
174	Port of Spain, Trinidad	In Family Hotel, No. 48 King street	b 360.00	Cleaner, light, oil, matches, brooms, ice, and water.
175	Puerto Principe, Cuba	In San Francisco College, San Francisco square	b 300.00	Janitor service and water.
176	Roseau, Dominica	In Bow Lane House, corner Hanover street and Bow lane.	b 240.00	Office room, storage, cellar, and platform on roof.
177	San Juan, Porto Rico	No. 5 Fortaleza street	a 600.00	Water.
178	Santiago de Cuba, Cuba	Corner of Nepomuceno and Enramadas, baja, No. 10	b 360.00	
179	Santo Domingo, Santo Domingo	In Vicini Building, No. 7 Santo Tomas street	a 480.00	
180	Willemstad, Curaçao	In Washington Villa, on Hoogstraat	b 341.40	Cleaner, electric light, water, ice, and bridge tolls.
	Total		5,439.40	

a In accordance with existing lease. b Under written agreement, lease being impracticable.

REPORT OF THE EDITOR, DIVISION OF PUBLICATIONS.

U. S. DEPARTMENT OF AGRICULTURE,
DIVISION OF PUBLICATIONS,
Washington, D. C., August 26, 1901.

SIR: I have the honor to submit herewith, for your information and consideration, a report on the work of this Division for the fiscal year ended June 30, 1901; also recommendations in regard to future operations.

Respectfully,

GEO. WM. HILL,
Editor and Chief.

Hon. JAMES WILSON, *Secretary.*

WORK OF THE YEAR.

WORK OF DIVISION GOVERNED BY GROWTH OF DEPARTMENT.

Before reviewing the work of the Division of Publications for the year just passed it seems desirable to call attention once more to the fact that, so far as the extent of the work is concerned, there is no control possible save the arbitrary limitation imposed by the amount of the appropriations. The extent of the work to be performed in this Division is absolutely dependent upon the growth of the Department and the activity of its various agencies. This activity depends in its turn upon so many extraneous conditions that no chief of any single Bureau, Division, or Office can even approximate at the beginning of the year the amount of printing which he will require during the year.

CONSEQUENCES OF INADEQUATE APPROPRIATIONS.

Inasmuch as the appropriations for our work are almost invariably inadequate, the facts just recited being apt to be overlooked, unfortunate consequences follow. One of these is the frequent appeal to Congress for a special appropriation for a particular publication much needed in the Department work and in much demand on the part of the public, but which, for want of funds, can not be printed without this special appropriation. The other consequence, and the most to be regretted, is the necessary withholding from publication of much timely and useful matter containing information of great practical utility, but which it is found quite impossible to print from the appropriation available for that purpose. Grievous injustice also ensues from the insufficiency of funds for the distribution of the publications printed, the unavoidable result being that a very large number of

faithful and deserving employees every year have to be furloughed for certain periods of time, causing much individual suffering, as well as working a very great demoralization to the force, to the great disadvantage of the work in the document section.

Of the appeals made to Congress for aid in publishing particular reports during the past year, the majority were successful, thanks to the cordial interest and energy of the honorable chairmen of the House and Senate Committees on Printing; but every year it happens that, unavoidably, especially during a short session, some of these special requests for printing, which are never made except in the most urgent cases, fail to receive favorable action, with most unfortunate results.

The close of the past fiscal year found us with over a score of bulletins in manuscript which had been withheld from publication for want of funds to print. While these were pushed through as rapidly as possible upon the new appropriation becoming available, the delay in their appearance is in every case regrettable and in many cases seriously detrimental to the objects these publications were designed to serve. Another serious result of inadequate appropriations is to be found in our inability to supply reprints when publications are exhausted, even though the Superintendent of Documents reports numerous applications received by him accompanied by cash to pay for the same. The growth in the sale of public documents through the Superintendent of Documents has during the past few years been remarkable, and it seems most unfortunate that circumstances should so often compel us to discourage it. Properly developed, this plan seems to offer the only true solution of the great problem attending the subject of equitable, judicious, and economical distribution of public documents.

NUMBER OF PUBLICATIONS ISSUED.

The total number of publications issued by the Department of Agriculture during the fiscal year ended June 30, 1901, was 606, of which 109 were publications of the Weather Bureau. With the editing and printing of the Weather Bureau publications this Division has no connection, and hence the number of publications issued under the supervision of the Department editor was 497. Of these, 263 were new, aggregating 14,458 printed pages, and the others, 234, were reprints, aggregating 8,818 printed pages. Of the reprints, 157 were Farmers' Bulletins. A list in detail of the publications issued during the year ended June 30, 1901, will be found in Appendix A.

The following shows the classes of publications composing the total 606, arranged according to the funds to which they were respectively charged:

Number and classes of publications, fiscal year 1901.

Publications:	
Chargeable to regular fund	274
Chargeable to divisional funds	36
Chargeable to Farmers' Bulletin fund	171
Printed as Executive documents	16
Printed at Weather Bureau	109
Total	606

The following table shows the number of publications, both original and reprint, and the aggregate number of pages and copies in each class, for the fiscal years 1899, 1900, and 1901:

Number of publications, original and reprint, and number of pages and copies of each class, fiscal years 1899, 1900, and 1901.

Character of publication.	1899.			1900.			1901.		
	Publications.	Pages.	Copies.	Publications.	Pages.	Copies.	Publications.	Pages.	Copies.
Original	191	12,864	4,099,288	225	10,852	4,338,978	262	14,656	3,903,094
Reprint	298	11,944	2,274,300	148	5,983	2,004,500	232	9,139	3,115,600
Weather Bureau	114	1,612	702,387	95	1,164	809,000	112	3,341	880,587
Total	603	26,420	7,075,975	468	17,999	7,152,478	606	27,136	7,889,281

The above table shows the great activity of the Department in the matter of publications. In the first place the original publications for the year number 262, exclusive of the Weather Bureau, a figure far higher than that of any previous year. The total number of pages in these new publications was also, as was to be expected, greater than ever before, aggregating 14,656. It may be noted that had the printing fund been adequate these figures would have been considerably increased, as there were held over, from want of funds to print, during the last two months of the fiscal year, more than twenty different publications. One feature of the above table deserves particular notice as illustrating the policy adopted with a view to greater economy. A comparison of the number of publications for each of the three years covered by the table with the number of copies shows the tendency toward smaller editions. This is particularly marked in the year just elapsed, where the total number of copies covered by the 263 new publications is considerably less than the total number for 1899, representing only 191 publications. This is the only method available by which this Division can exercise any restriction over the expenditures for printing.

In the case of reprints composed largely, it may be stated, of Farmers' Bulletins, this restriction in the size of the edition is not possible. We find that although the number of reprints in 1901 exceeded the number in 1900 by less than 50 per cent, the increase in the number of copies in 1901 was largely in excess of 50 per cent, aggregating over 3,100,000 copies.

For purposes of comparison, a table is appended showing the total number of copies of all the Department publications, together with the aggregate number of copies issued, for the nine years ended with the 30th of June last. In view of the fact that all the work of the Department is reflected in its publications, this table affords a very interesting illustration of the growth and development of the Department during the last decade. The increase from 210 publications aggregating something over 2,500,000 copies in 1893, to 606 publications aggregating nearly 8,000,000 copies in 1901, bears eloquent testimony to the constant increase in the work of the Department of Agriculture.

Number of publications issued from 1893 to 1901, by years.

Year.	Number of publications.	Total number of copies.
1893	210	2,689,084
1894	205	3,169,310
1895	254	4,100,660
1896	376	6,561,700
1897	424	6,541,210
1898	501	6,280,365
1899	603	7,075,975
1900	468	7,152,428
1901	606	7,899,281
Total	3,647	51,470,013

To complete the record of the year's work a table is given showing the number of publications issued from each Bureau, Division, or Office of the Department, segregating the originals and reprints, and showing also the number of pages in the aggregate number of copies. In the preparation of this table Farmers' Bulletins are not given separately, but are included in the statement of the Bureau, Division, or Office contributing the same. On the other hand, Executive documents, namely, those published by Congress, are enumerated together without reference to the Bureau, Division, or Office from which they emanated.

Number of publications, original and reprint, and pages, by Bureaus, Divisions, and Offices, 1901.

[Farmers' Bulletins are included in the Bureaus, Divisions, and Offices contributing them.]

Bureaus, Divisions, and Offices.	Publications.			Pages.			Number of copies.		
	Original.	Reprint.	Total.	Original.	Reprint.	Total.	Original.	Reprint.	Total.
Secretary's Office	9	6	15	382	206	588	36,900	35,000	71,900
Executive documents	12	4	16	3,226	751	3,977	590,844	42,000	632,844
Accounts and Disbursements	2	----	2	80	----	80	3,200	----	3,200
Agrostology	19	10	29	1,214	277	1,491	47,500	180,000	227,500
Animal Industry	24	32	56	800	1,172	1,972	74,200	558,000	632,200
Biological Survey	13	7	20	481	367	848	40,450	44,000	84,450
Botany	14	10	24	820	316	1,136	110,200	134,000	244,200
Chemistry	10	9	19	448	357	805	47,650	83,000	130,650
Entomology	18	23	41	750	572	1,322	127,450	147,500	274,950
Experiment Stations	49	82	131	3,593	3,566	7,159	297,600	1,212,600	1,509,600
Foreign Markets	6	3	9	336	215	551	54,000	3,000	57,000
Forestry	7	8	15	136	405	541	84,500	39,000	123,500
Gardens and Grounds	1	----	1	7	------	7	1,000	----------	1,000
Library	5	----	5	102	------	102	3,950	----------	3,950
Plant Industry	1	----	1	40	------	40	30,000	----------	30,000
Pomology	1	9	10	6	246	252	200	156,500	156,700
Publications	22	6	28	976	176	1,152	771,500	160,000	931,500
Public Road Inquiries	3	10	13	44	312	356	14,000	112,500	126,500
Seed and Plant Introduction	3	----	3	118	------	118	7,500	----------	7,500
Soils	10	4	14	202	66	268	18,850	57,000	75,850
Statistics	20	----	20	329	------	329	1,503,000	----------	1,503,000
Vegetable Physiology and Pathology	13	9	22	566	135	701	39,200	151,500	190,700
Weather Bureau	108	4	112	3,180	161	3,341	832,587	48,000	880,587
Total	370	236	606	17,836	9,300	27,136	4,735,681	3,163,600	7,899,281

FARMERS' BULLETINS.

The appropriation for the preparation and printing of Farmers' Bulletins was $57,500, of which $51,798.63 was expended for printing and $5,701.37 for the preparation of such bulletins.

During the past year only 14 new Farmers' Bulletins were issued, but the calls for reprints were so numerous that 157 of these were issued, aggregating nearly 3,000,000 copies. The total number of copies of the new bulletins aggregated 415,000. The Congressional distribution, as the tables will show, was larger than ever before, the provision for printing having been increased over the year previous and a considerable number having been left over from June 30, 1900, which by your order were added to the Congressional supply for the fiscal year 1901. This enabled us to make the quota for each Senator, Representative, and Delegate 7,000 copies. The total number of Congressional quotas drawn was 413, aggregating 2,195,010 copies. This left again a considerable number (over 1,000,000), which reverted to the Secretary for the current year. Adding this, as per your direction, to the number it will probably be possible to print, owing to the increased appropriation, will permit of raising the quota for Señators, Representatives, and Delegates for the current year to 15,000 copies. Under the present law four-fifths instead of two-thirds of the total number of Farmers' Bulletins printed are reserved for the use of Congressmen, with, however, the same proviso as heretofore in regard to quotas unused on or before the 30th of June of each year, by which all such quotas revert to the Secretary of Agriculture, to be disposed of at his discretion. So far all surplus copies thus accumulating to the Secretary's credit have been included in the Congressional distribution for the succeeding year.

The appropriation for this Division for the current year includes a provision of $2,500 for the rent of a building and for such alterations as may be needed to fit it for the storage of publications. In accordance with this provision, a contract for a lease was made for a building to be erected for the accommodation of a portion of the document section in conjunction with the vegetable pathological and physiological investigations. This building is now approaching completion, and the basement and two stories of the eastern side will be placed at the disposal of this Division, which will be occupied for the storage and distribution of Farmers' Bulletins. This will greatly relieve the congested condition of those portions of the building hitherto devoted to the storage and shipment of publications. This relief becomes all the more important in view of the great increase contemplated in the number of Farmers' Bulletins to be published, which will aggregate about 7,000,000 copies.

The tables following show the details connected with the issue of Farmers' Bulletins—the originals and reprints published during the year, with comparative figures for 1900 and 1899, the total cost of printing, the titles and number of copies of the new bulletins, the number contributed by the several Bureaus, Divisions, and Offices, etc. One of these tables shows that the total number of copies of Farmers' Bulletins issued since the first number appeared is 16,975,500, of which there have been distributed upon Congressional orders 10,713,671. The total number of Farmers' Bulletins issued since the beginning, including those now in press, is 139. For a detailed statement of the publications received and distributed during the year, see Appendix B.

Farmers' Bulletins issued 1899–1901, by years.

Originals and reprints of Farmers' Bulletins.	Number of bulletins	Number of copies.
Fiscal year 1901:		
Originals	14	415,000
Reprints	157	2,930,000
Total	171	3,345,000
Fiscal year 1900:		
Originals	18	525,000
Reprints	90	1,835,000
Total	108	2,360,000
Fiscal year 1899:		
Originals	22	520,000
Reprints	154	1,917,000
Total	176	2,437,000

Cost of printing Farmers' Bulletins, 1900–1901.

Item.	Number of bulletins	Number of copies.	Cost.
Fiscal year 1901:			
Paid from Farmers' Bulletin fund	171	3,345,000	$51,796.68
Fiscal year 1900:			
Paid from Farmers' Bulletin fund	97	2,150,000	30,665.15
Paid from general printing fund	11	210,000	3,469.69
Total	108	2,360,000	34,134.84

New Farmers' Bulletins issued during the fiscal year 1901.

No. of bulletin.	Title of bulletin.	Total number of copies.
119	Experiment Station Work—XV	30,000
120	The Principal Insects Affecting the Tobacco Plant	30,000
121	Beans, Peas, and other Legumes as Food	30,000
122	Experiment Station Work—XVI	30,000
123	Red Clover Seed: Information for Purchasers	30,000
124	Experiment Station Work—XVII	30,000
125	Protection of Food Products from Injurious Temperatures	20,000
126	Practical Suggestions for Farm Buildings	50,000
127	Important Insecticides: Directions for Their Preparation and Use	30,000
128	Eggs and Their Uses as Food	30,000
129	Sweet Potatoes	30,000
130	The Mexican Cotton-Boll Weevil	30,000
131	Household Tests for the Detection of Oleomargarine and Renovated Butter	30,000
132	The Principal Insect Enemies of Growing Wheat	15,000
	Total	415,000

Farmers' Bulletins reprinted during the fiscal year 1901.

No. of bulletin.	Title of bulletin.	Total number of copies.
16	Leguminous Plants for Green Manuring and for Feeding	35,000
17	Peach Yellows and Peach Rosette	20,000
21	Barnyard Manure	50,000
22	The Feeding of Farm Animals	40,000
23	Foods: Nutritive Value and Cost	30,000
24	Hog Cholera and Swine Plague	45,000
26	Sweet Potatoes: Culture and Uses	30,000
27	Flax for Seed and Fiber	20,000
28	Weeds: And How to Kill Them	30,000
29	Souring of Milk and Other Changes in Milk Products	30,000

Farmers' Bulletins reprinted during the fiscal year 1901—Continued.

No. of bulletin.	Title of bulletin.	Total number of copies.
30	Grape Diseases on the Pacific Coast	10,000
31	Alfalfa, or Lucern	20,000
32	Silos and Silage	20,000
33	Peach Growing for Market	30,000
34	Meats: Composition and Cooking	15,000
35	Potato Culture	55,000
36	Cotton Seed and Its Products	30,000
37	Kafir Corn: Characteristics, Culture, and Uses	20,000
38	Spraying for Fruit Diseases	20,000
39	Onion Culture	45,000
40	Farm Drainage	45,000
41	Fowls: Care and Feeding	75,000
42	Facts About Milk	55,000
44	Commercial Fertilizers: Composition and Use	20,000
45	Some Insects Injurious to Stored Grain	10,000
46	Irrigation in Humid Climates	20,000
47	Insects Affecting the Cotton Plant	10,000
48	The Manuring of Cotton	35,000
49	Sheep Feeding	20,000
50	Sorghum as a Forage Crop	45,000
51	Standard Varieties of Chickens	45,000
52	The Sugar Beet: Culture, Seed, Development, Manufacture, and Statistics	45,000
54	Some Common Birds in Their Relation to Agriculture	20,000
55	The Dairy Herd: Its Formation and Management	45,000
56	Experiment Station Work—I	15,000
57	Butter Making on the Farm	55,000
58	The Soy Bean as a Forage Crop	10,000
59	Bee Keeping	15,000
61	Asparagus Culture	40,000
62	Marketing Farm Produce	30,000
63	Care of Milk on the Farm	45,000
64	Ducks and Geese: Standard Breeds and Management	25,000
65	Experiment Station Work—II	15,000
66	Meadows and Pastures: Formation and Cultivation in the Middle Eastern States	30,000
67	Forestry for Farmers	30,000
69	Experiment Station Work—III	30,000
70	The Principal Insect Enemies of the Grape	15,000
71	Some Essentials in Beef Production	45,000
73	Experiment Station Work—IV	10,000
74	Milk as Food	30,000
75	The Grain Smuts: How They Are Caused and How to Prevent Them	30,000
76	Tomato Growing	45,000
77	The Liming of Soils	15,000
78	Experiment Station Work—V	15,000
79	Experiment Station Work—VI	15,000
80	The Peach Twig-Borer: An Important Enemy of Stone Fruits	35,000
81	Corn Culture in the South	30,000
84	Experiment Station Work—VII	15,000
85	Fish as Food	30,000
86	Thirty Poisonous Plants	30,000
87	Experiment Station Work—VIII	10,000
89	Cowpeas	30,000
90	The Manufacture of Sorghum Sirup	25,000
91	Potato Diseases and Their Treatment	40,000
92	Experiment Station Work—IX	15,000
94	The Vegetable Garden	60,000
95	Good Roads for Farmers	100,000
96	Raising Sheep for Mutton	30,000
99	Three Insect Enemies of Shade Trees	35,000
100	Hog Raising in the South	15,000
101	Millets	15,000
102	Southern Forage Plants	25,000
103	Experiment Station Work—XI	15,000
104	Notes on Frost	45,000
105	Experiment Station Work—XII	15,000
106	Breeds of Dairy Cattle	110,000
107	Experiment Station Work—XIII	15,000
109	Farmers' Reading Courses	80,000
110	Rice Culture in the United States	10,000
111	The Farmers' Interest in Good Seed	35,000
112	Bread and the Principles of Bread Making	50,000
113	The Apple and How to Grow It	90,000
114	Experiment Station Work—XIV	20,000
116	Irrigation in Fruit Growing	30,000
117	Sheep, Hogs, and Horses in the Pacific Northwest	60,000
118	Grape Growing in the South	60,000
119	Experiment Station Work—XV	20,000
121	Beans, Peas, and Other Legumes as Food	60,000
122	Experiment Station Work—XVI	30,000
	Total	2,930,000

Farmers' Bulletins contributed by Bureaus, Divisions, and Offices, 1901.

Bureaus, Divisions, and Offices.	New bulletins and reprints.	Number of copies.	Cost.
Secretary's Office	2	30,000	$450.99
Agrostology	8	165,000	2,319.94
Animal Industry	27	515,000	8,598.88
Biological Survey	1	20,000	404.19
Botany	8	155,000	1,994.24
Chemistry	5	100,000	1,576.70
Entomology	12	225,000	3,775.33
Experiment Stations	74	1,355,000	20,173.88
Forestry	2	30,000	601.27
Plant Industry	1	30,000	641.08
Pomology	6	150,000	2,209.92
Publications	8	210,000	3,555.36
Public Road Inquiries	4	100,000	2,137.07
Soils	2	45,000	587.04
Vegetable Physiology and Pathology	8	150,000	1,823.25
Weather Bureau	3	65,000	947.54
Total	171	3,345,000	51,796.68

Number of copies of Farmers' Bulletins issued (Nos. 1 to 132) and number distributed to Members of Congress, 1894–1901.

Date.	Total number of copies issued.	Congressional distribution.
Prior to 1894	540,000	----------
In 1894	278,500	----------
In 1895	1,567,000	885,770
In 1896	1,891,000	1,316,695
In 1897	2,387,000	1,967,237
In 1898	2,170,000	1,580,065
In 1899	2,437,000	1,101,985
In 1900	2,360,000	1,666,909
In 1901	3,345,000	2,195,010
Total	16,975,500	10,713,671

New Farmers' Bulletins issued in each year from 1895 to 1901, inclusive.

Year.	Number of bulletins.
In 1895	11
In 1896	13
In 1897	16
In 1898	21
In 1899	22
In 1900	18
In 1901	14
Total	115

THE YEARBOOK FOR 1900.

Thanks to the untiring efforts of my assistants and to the energy of the Public Printer, the first delivery of the Yearbook for 1900 was on May 27, 1901. This volume seems to have been, judging by press comment, as well received as any of its predecessors, the only criticism of it, and that a just one, being the extreme bulkiness which the book has assumed. This is largely due to the tendency of contributors to furnish lengthy articles, a tendency which every effort will be made

to check in the preparation of the forthcoming volume, namely, the Yearbook for 1901. In the call for contributions from the several Bureaus, Divisions, and Offices special emphasis has been laid upon the necessity of furnishing shorter articles, and also upon your desire that every chief should, if possible, be represented by a paper in the Yearbook setting forth in a plain and interesting fashion the scope and purpose of some branch of the work carried on under his supervision.

Another cause for the increase in size of this book is the growing demand for a greater variety of information, such as is contained in the Appendix. The readers of the Yearbook have become accustomed to referring to the Appendix for a large amount of information on a great variety of subjects, such as is not, it is believed, brought together in any other publication; and the fact that it is not elsewhere available renders it extremely undesirable to so restrict the limits of the Appendix as to eliminate important information which can not be procured elsewhere.

REQUISITIONS FOR PRINTING.

The total number of requisitions for printing signed by the chief of this Division was 2,746, of which 28 were subsequently canceled, leaving 2,718. Of these, 626 were drawn upon the main office and 2,092 upon the branch office. The number of requisitions issued yearly since 1898 is as follows: In 1898, 1,890; 1899, 2,342; 1900, 2,450; 1901, 2,746. The following statements show the number of requisitions drawn upon the Government Printing Office for the several Bureaus, Divisions, and Offices during the past fiscal year:

MAIN OFFICE.

Requisitions on the main office by Bureaus, Divisions, Offices, etc., 1901.

Secretary's Office	4
Accounts and Disbursements	44
Agrostology	22
Animal Industry	103
Biological Survey	17
Botany	28
Chemistry	26
Entomology	32
Office of Experiment Stations	133
Foreign Markets	14
Forestry	27
Gardens and Grounds	1
Library	21
Plant Industry	1
Pomology	11
Publications	31
Public Road Inquiries	12
Soils	23
Statistics	29
Vegetable Physiology and Pathology	24
Weather Bureau	4
Miscellaneous	19
Total	626

BRANCH OFFICE.

The branch printing office continues to gain in usefulness in spite of the very discouraging conditions under which the work has to be

carried on, owing to its utterly inadequate and unsuitable accommodations; this alone interferes with the full realization of all the facilities which this office should afford in the Department's work, the Public Printer himself having at all times shown the most cordial disposition to increase its usefulness so far as dependent upon him. Special credit is due to Mr. Frank Wallace for the admirable work performed under his supervision, in view especially of the difficulties he has had to contend with for the reason above stated. Since 1899 the total number of copies of publications issued through the branch office has nearly doubled, and this without taking into account the Monthly Crop Reporter, printed for the Division of Statistics, the composition for which is done in the branch office. For the year under consideration, 76 of the total number of requisitions issued upon the branch office were for the printing of publications aggregating 1,319,800 copies.

Requisitions on the branch office by Bureaus, Divisions, Offices, etc., 1901.

Secretary's Office	143
Accounts and Disbursements	38
Agrostology	85
Animal Industry	227
Biological Survey	57
Botany	258
Chemistry	77
Entomology	53
Office of Experiment Stations	171
Foreign Markets	23
Forestry	103
Gardens and Grounds	58
Library	30
Plant Industry	2
Pomology	30
Publications	211
Public Road Inquiries	37
Soils	46
Statistics	292
Vegetable Physiology and Pathology	70
Weather Bureau	2
Miscellaneous	99
Total	2,092
Canceled	28

Job work done in the branch printing office, 1901.

Envelopes	1,576,169
Letter heads and note heads	729,976
Cards	1,436,855
Circulars	326,900
Blanks	4,186,658
Labels and shipping tags	456,231
Franks	4,086,560
Monthly and other lists	677,736
Crop Reporter	[1]369,000
Circular letters and other notices	518,040
Miscellaneous	903,317
Total	15,267,472

[1] Composition for Crop Reporter for months of August, September, October, November, 1900, and April, May, June, and July, 1901, was performed in branch office. Printing of Crop Reporter for these months was performed at the main office.

Publications printed in the branch printing office, 1901.

Bureaus, Divisions, and Offices.	Requisitions.	Number of copies printed.
Agrostology	9	38,000
Animal Industry	7	50,000
Biological Survey	8	28,000
Botany	5	58,000
Chemistry	2	2,000
Entomology	13	31,500
Experiment Stations	5	11,300
Forestry	3	24,000
Pomology	1	5,000
Publications	16	697,000
Statistics	7	375,000
Total	76	1,319,800

Additional evidence, if any were needed, of the large amount of work done in the branch office is offered by the fact that during the fiscal year 2,324½ reams of paper were used, aggregating a total weight of 52½ tons.

EXPENDITURES FOR PRINTING AND BINDING.

The appropriation for printing and binding was $110,000, of which $20,000 was for the use of the Weather Bureau, and over which this office exercised no supervision. Of the $90,000 for the use of the Department, the expenditures during the year were $89,427.46, as shown in the accompanying statement. This does not include the total expenditures for printing, however, since various Bureaus, Divisions, and Offices have special funds from which printing may be defrayed, although there is no specific amount set aside for such purpose. The total expenditures from the three funds from which printing may be defrayed, viz, the regular printing fund, the fund for Farmers' Bulletins, and from the special divisional funds are set forth in the subjoined statements. These statements also give the amount expended for each Bureau, Division, and Office of the Department from the general printing fund, and a summary of the expenditures under the several accounts of the Division of Publications for the year. The total expenditures for printing and binding delivered to the Department from July 1, 1900, to June 30, 1901, inclusive, was $160,462.[1]

Amount expended for the various Bureaus, Divisions, and Offices for printing and binding, 1901.

Division of Accounts	$1,444.65
Bureau of Animal Industry	1,239.16
Division of Agrostology	1,668.54
Division of Biological Survey	2,647.90
Division of Botany	5,215.57
Division of Chemistry	2,650.59
Division of Entomology	2,063.67
Office of Experiment Stations	14,575.73
Section of Foreign Markets	4,592.44
Division of Forestry	5,016.55
Division of Gardens and Grounds	24.01
Library	2,106.29

[1] It should be stated that these figures do not cover expenditures for the Weather Bureau, for the use of which $20,000 of the regular printing fund has been set aside, and whose printing work, as above stated, is entirely segregated from this Division.

Division of Pomology	$547.42
Division of Publications	3,359.21
Office of Public Road Inquiries	403.60
Division of Soils	2,391.53
Division of Statistics	7,962.42
Division of Vegetable Physiology and Pathology	4,844.28
Miscellaneous	3,534.93
Seed and Plant Introduction	52.28
Printing at branch printing office for the various Bureaus, Divisions, and Offices	23,086.69
Total	89,427.46

Expenditures for printing and binding, total and by funds, 1901.

TOTAL EXPENDITURES.

Divisional publications paid from general fund (not including Farmers' Bulletins)	$57,907.05
Farmers' Bulletins	51,798.63
Blank books, etc	8,433.72
Branch office (all work)	23,086.69
Divisional publications paid from special funds	17,890.07
Blank books, etc., paid from special funds	1,345.84
Total	160,462.00

EXPENDITURES BY FUNDS.

General printing fund ($90,000, exclusive of $20,000 for Weather Bureau):		
Expended for the various Bureaus, Divisions, and Offices	$66,340.77	
Expended for printing at branch office for the various Bureaus, Divisions, and Offices	23,086.69	
		$89,427.46
Farmers' Bulletin fund		51,798.63
Divisional funds:		
Bureau of Animal Industry	6,145.07	
Division of Biological Survey	378.07	
Division of Botany	497.00	
Division of Entomology	575.88	
Office of Experiment Stations	6,079.27	
Office of Foreign Markets	3,098.06	
Division of Statistics	2,462.56	
		19,235.91
Total		160,462.00

SALE OF PUBLICATIONS.

The question of an equitable distribution of publications of the Department becomes more and more urgent and difficult every year. The Superintendent of Documents, to whom, under the law, all the publications of this Department should be turned over yearly, except such as are required for official use, not only reports a continued increase of demand, but deplores the fact that we are unable to supply him with a number sufficient to meet the calls upon him.

The desirability of cooperating with this officer in the sale of our publications has been frequently dwelt upon, and it is emphasized every year by the utter inadequacy of the funds at our disposal for printing and thus supplying the demands made upon us. Every year the free miscellaneous distribution needs to be further restricted, and to do this with fairness to all concerned is not only difficult but well-nigh impossible. It will be a great help in the way of keeping the Superintendent of Documents supplied with such of our publications as he has a demand for were the law so amended as to permit the funds received by him from the purchasers, after deducting a certain percentage for

expenses, to be devoted to the reprint, with the approval of the Secretary of Agriculture, of those publications for which the demand continues. In 1900 the sales fell off somewhat from the two years previous, but this was due almost entirely to the cause stated, namely, our inability to supply copies of publications asked for. In 1901 we have been more fortunate, and the result has been seen in the great increase in the number of publications sold. For purposes of comparison, the accompanying table shows not only the sales and receipts for this Department, but for all the other Departments. It will be seen that in 1901 the Superintendent of Documents sold of the publications of the Department of Agriculture 24,127 copies and of all other Departments 9,458. The publications of this Department were, as might be expected, far less costly than those of the other Departments, hence we find that the receipts for the publications of all the other Departments amounted to $6,862.44 and the receipts for publications of this Department were $3,220.25. These figures show an extraordinary increase since 1896, the first year that the documents were sold by the Superintendent, the number of publications of this Department sold by him in that year being 2,818 and the receipts $353.10.

Number of publications sold and amount received, 1898–1901.

Department.	Copies of publications sold.				Amount received.			
	1901.	1900.	1899.	1898.	1901.	1900.	1899.	1898.
Department of Agriculture	24,127	16,905	18,750	17,740	$3,220.25	$2,157.65	$2,154.45	$2,089.15
All other Departments	9,458	10,928	8,058	3,623	6,862.44	6,744.56	5,401.66	2,448.12
Total	33,585	27,903	26,808	21,363	10,082.69	8,902.21	7,556.11	4,537.27

ILLUSTRATION WORK.

The total number of original drawings, photographs, etc., prepared in the section of illustrations during the year was 2,401, and of wood engravings 23. The total cost of the illustration work was $8,971.62, of which $2,400.51 was defrayed from divisional funds.

The following table gives the number and cost of illustrations:

Number and cost of illustrations by Bureaus, Divisions, and Offices, 1901.

Bureaus, Divisions, and Offices.	Illustrations.	Cost of illustrations.	Amount chargeable to divisional funds.	Amount chargeable to Division of Publications' illustration fund.
Agrostology	58	$120.17	$120.17	
Animal Industry	[1]50	534.11	534.11	
Biological Survey	29	116.20	116.20	
Botany	1	2.08		$2.08
Entomology	229	461.08	461.08	
Experiment Stations	[1]24	1,003.23	999.79	3.44
Forestry	17	67.43	59.60	7.83
Gardens and Grounds	1	2.32		2.32
Pomology	10	38.39	38.39	
Publications	32	39.33		39.33
Soils	8	25.64	24.80	.84
Statistics	2	2.87	2.87	
Vegetable Physiology and Pathology	25	51.50	43.50	8.00
Total	486	2,464.35	2,400.51	63 84
Artists' supplies		717.04		717.04
Artists' salaries		5,790.23		5,790.23
Total		8,971.62	2,400.51	6,571.11

[1] Lithographs.

Furnishing duplicates of our illustrations to various correspondents for reproduction in their publications takes up considerable time of our employees. Altogether, 1,457 duplicates were made by us upon the requests of correspondents, the cost thereof being defrayed by the applicants.

A statement in detail of the work of the section of illustrations follows:

Work of the section of illustrations, 1901.

	Number.
Drawings, retouching photographs, photographing on wood, etc., made by the artists in the Division of Publications	2,401
Wood engravings	23
Requests for duplicate electrotypes	177
Duplicate electrotypes furnished to correspondents on request	1,457
Requisitions and authorizations	141
Illustrations printed or published (not including reprints)	2,095

THE DOCUMENT SECTION.

During the fiscal year ended June 30, 1901, Farmers' Bulletins to the number of 3,359,881 were received from the Government Printer, and 3,016,353 were distributed, more than two-thirds of these being mailed at the request of Senators, Representatives, and Delegates. Of miscellaneous publications other than Farmers' Bulletins, 3,205,591 copies were received from the Public Printer, and 3,137,671 were distributed to applicants for the same, making a total of 6,154,024 different documents mailed from the document section.

The preparing of addresses, answering of correspondence, and handling of this number of publications entailed upon the document section an amount of clerical and semiclerical work relatively as great as the manual labor involved in wrapping the documents for mailing. Each request for publications and for information concerning publications received in the document section receives careful attention and a prompt reply. In the furtherance of this work, 2,869 letters were prepared for the Secretary's signature, and 8,302 were written for the signature of the Editor-in Chief. In addition to this, 228,253 blank forms, postal cards, and notification slips, bearing the printed signature of the Editor, were mailed to correspondents, and over 176,000 orders were written, filled, entered, and filed for future reference; 3,238,288 franks or envelopes were addressed; and over 60,000 cards were used in indexing the names of the recipients of the more valuable publications.

EXPENDITURES FROM SPECIAL FUND OF THE DIVISION.

The following statement shows the total expenditures during the year from the special appropriation for this Division, including the amounts for preparation and printing of Farmers' Bulletins, for artists and preparation of illustrations, for artists' supplies, and for labor and materials in distribution of documents:

Pay of artists and preparation of illustrations	$5,575.00
Labor in distribution of documents	41,186.57
Materials for document section	5,115.38
Artists' supplies	717.04
Illustrations	63.84
Manuscript for publication	300.00
Total	52,957.83

Preparation of Farmers' Bulletins	$5,601.60
Printing of Farmers' Bulletins	51,798.63
Total	57,400.23
Grand total	110,358.06

PUBLICATIONS PRINTED UNDER ACT OR SPECIAL RESOLUTION.

The following is a list of publications not covered by the appropriations for printing, but provided for by act or by special resolution of Congress:

PROVIDED FOR BY ACT OF CONGRESS.

Yearbook of the Department of Agriculture, 1900.
Expenditures in the Department of Agriculture.
Annual Reports of the Department of Agriculture for the fiscal year ended June 30, 1900.
Operations of the Bureau of Animal Industry.
Sixteenth Annual Report of the Bureau of Animal Industry, for the year 1899.

PROVIDED FOR BY SPECIAL RESOLUTION OF CONGRESS.

Field Operations of the Division of Soils, 1899.
Peach-Leaf Curl: Its Nature and Treatment.
Agricultural Resources and Capabilities of Porto Rico.
Irrigation Investigations in California.
The Agricultural Experiment Stations in the United States.
Report on the Agricultural Resources and Capabilities of Hawaii.
Fourth Report on the Agricultural Investigations in Alaska, 1900.
Report on the Big Trees of California.
A Primer of Forestry, Part I: The Forest.
Progress of the Beet-Sugar Industry in the United States in 1899, with a Supplementary Report on the Cane-Sugar Industry of the Hawaiian Islands.

RECOMMENDATIONS.

COMPENSATION OF ASSISTANTS.

In submitting estimates for the expenses of this Division for the ensuing fiscal year, I feel compelled, in justice to my chief assistants, to call attention to the fact that their remuneration is quite inadequate to the quality and quantity of service rendered by them. The responsibilities of my editorial assistants have greatly increased with the enormous increase of work, and the service exacted of them demands that they should be recognized as assistant editors. In the case of almost every one of them the term editorial clerk is a misnomer. I trust, then, that it will be possible before long to secure for them and for the other meritorious clerks and employees the practical recognition which their services deserve. In justice to them I shall also place on record here the fact that it is very seldom that any one of my principal assistants enjoys the full term of his leave, while every one of them frequently contributes extra labor for the purpose of aiding in the prompt and efficient performance of our work.

What has been said in regard to my principal assistants in the editorial division equally applies to the assistant in charge of the document section, and to several members of our clerical force, especially those having charge of the books and of the supervision of the work of others. In the estimates of next year some transfers have been made from the Farmers' Bulletin roll to the statutory roll, this being, it is understood, in accordance with the wishes of Congress, and some additional clerical force has been included.

NECESSITY FOR ADDITIONAL EMPLOYEES.

The merest reference to the record of the work done preceding these recommendations will afford conclusive evidence of the necessity for a considerable addition to our force, if we are to perform the duties devolving upon us with promptness and efficiency. In this connection it is important to reiterate the fact that it is not in my power in any way to reduce the quantity of work save by good management in its disposition. The amount of work depends entirely upon the general work of all the several Bureaus, Divisions, and Offices in the Department, any addition to which involves, necessarily, an increase in the labors and responsibilities of the Division of Publications, which is the channel through which all published results of work done must reach the public. That a sufficient force be maintained, therefore, in this Division, to secure promptness in the publication of manuscripts submitted, is of such importance as to be represented by a very considerable money value to the country. Delay in publication for a few weeks may frequently postpone all possibility of any practical results from the information given for twelve months.

The distribution of documents is subject to the same conditions as the rest of our work, in this case a great desideratum being promptness and accuracy. The requests for publications and correspondence in regard thereto result in an average of letters received of about 1,000 a day, all of which must be carefully read, in most cases orders transcribed, and in all cases some form of reply sent.

Taking into account the great increase in our work in all directions, the impossibility also of foreseeing the exact amount of work to be done during the next fiscal year, as explained above, and the serious consequence of delay, the necessity for a considerable enlargement of our immediately available resources will, I think, amply account for the increased appropriation asked for—an increase amounting to $45,800.

ADDITIONAL FARMERS' BULLETINS.

The provision for the current year for Farmers' Bulletins, 80 per cent of which are subject to the orders of Senators, Representatives, and Delegates in Congress, will involve an increase in the total number of bulletins to be handled of 3¾ millions at least, to say nothing of the probable increase in our technical and miscellaneous publications. The force which can be maintained upon the present appropriation is utterly inadequate to dispose of this additional work, and unless Congress shall see fit to provide additional funds, available for expenditure during the current year, the work of the distribution of these bulletins must necessarily be intermitted.

It is found quite impossible to obtain any additional service from the teams now employed in the Department, and it will be necessary that, for this Farmers' Bulletin work, a special wagon and team be procured and maintained.

ILLUSTRATION WORK.

Reference to the estimates will show that a special appropriation is asked for illustration work, including also additional assistance when necessary, and for the purchase of valuable manuscripts. The total amount asked for these objects is considerably less than the sum appropriated for illustrations alone ten years ago, when the number of publications was barely one-fifth of those issued to-day.

THE PRINTING FUND.

An increase in the printing fund of $30,000 was granted by Congress for the present year, $10,000 of which, however, is for the exclusive benefit of the Weather Bureau. It was believed when the present appropriation was asked for that it would be amply sufficient, but such has not been the case. The large number of publications held up during the close of the last fiscal year and necessarily charged to this year's appropriation will leave actually available for this year's publications very little more than we had last year. The development of the Department and the extension of its several lines of work have been so rapid as to entirely outstrip the development and extension of this Division, the work of which, for the reasons already stated, necessarily reflects, and in fact should keep full pace with, the general work of the Department. The fact that all the information acquired in the several Bureaus, Divisions, and Offices of the Department can be made of use only by being diffused—an obligation specifically recognized in the organic law creating the Department—makes it a simple and logical conclusion that with every extension of work in any branch of the Department corresponding allowance for increased funds for printing must be made. Otherwise some valuable information will have to be suppressed.

SALE OF DOCUMENTS.

On this subject, to which I am unavoidably compelled to refer every year, I can only repeat the remarks of former years, and this with the added weight of additional experience. In spite of the great extent to which our publications are distributed gratuitously, the sales by the Superintendent of Documents continue to increase, and we have that gentleman's assurance that such sales would be far more than doubled were the number of publications placed at his disposal adequate to meet the demand. To do this it would be necessary to reprint publications from time to time, just as often as necessary to meet the continued demand for them. That such was actually the intention of Congress when it adopted the act for the public printing and binding of January 12, 1895, I have no doubt. At the same time, it is obvious that to do this would greatly overtax the printing fund available for the Department's use. An amendment to this act is urgently needed, providing that the sums received by the Superintendent of Documents from the sale of publications should be placed to the credit of the various Departments and added to their printing funds in the hands of the Public Printer, who should retain only a certain percentage, representing the expense of handling the business in the office of the Superintendent. Such an addition to our printing fund would, without doubt, enable us to always respond by means of reprints to the demands for a further supply of any publication by the Superintendent of Documents. A very great saving would be effected and a great extension in the distribution of the useful information acquired in the Department would be secured. If sections 42 and 52 of the act already referred to were amended so as to allow States, municipalities, and public educational or benevolent institutions to obtain, with the approval of the Secretary of Agriculture, and by paying the actual cost of the same, a reasonable number of copies of any publication, or the plates from which the same have been printed, the public would be efficiently served and the present enormous waste arrested. This amendment

should also provide that all free distribution to individuals should be stopped; that all of our publications be placed on sale at the cost of preparing, presswork, and binding, with a small percentage added for handling, and that only emergency circulars be given a free miscellaneous distribution.

With the law thus amended no possible excuse could exist for the restriction as to the number of copies of the publication issued, a restriction which at present declares that no report, publication, or document shall be printed in excess of 1,000 of each in any one fiscal year without authorization therefor by Congress, the only exception to this limitation being the annual reports of the heads of Departments and publications authorized by the Secretary of Agriculture when the same shall not exceed 100 octavo pages. The securing of the authorization of Congress is difficult. Even when Congress is in session an authorization is usually obtainable only by unanimous consent, and during many months, when Congress is not in session, such authorization, of course, is impossible. This restriction therefore seems to seriously hamper the work of the Department, and very often works great injustice to many persons, who have, at considerable expenditure of time, and in some cases of money, assisted the Department in securing the data for a publication. These persons do this usually with the implied understanding that their efforts will be recognized at least with a copy of the publication to which they thus contribute. It is not right that they should be disappointed. With the gratuitous distribution of public documents restricted in accordance with the recommendations made above, there should be no need for this restriction, as it is manifestly proper that certain public institutions should receive each a copy of every publication issued, and the general public should be entitled to as many as it feels disposed to purchase.

THE YEARBOOK.

The grave inconvenience to which the Department is subjected by the small number of copies, in proportion to the total edition, of the Yearbook placed at the disposal of the Secretary, makes necessary an appeal to Congress for a more liberal allowance. In the days when the total number issued of this publication was but 300,000, and when the work of this Department was not one-fourth of what it now is, 30,000 copies were placed at the disposal of the head of this Department, then Commissioner of Agriculture. To-day, with 500,000 copies issued yearly, the same number, 30,000 copies, is placed at the disposal of the Secretary. It seems hardly necessary to add anything to this comparison. Fifty thousand copies, at least, are needed for the use of the Secretary of Agriculture.

UNIFORMITY OF STYLE IN PUBLICATIONS.

Some means should be adopted to secure uniformity of style in the publications of the Department, so as to obviate the present confusion, annoyance, and expense resulting from individual preferences as regards orthography, capitalization, use of italics, compounding of words, etc., in the bulletins and reports of the various Bureaus, Divisions, and Offices. Unfortunately, the idiosyncrasies are too often not indicated in the manuscripts submitted, but are insisted upon after the matter is in proof, and the changes involve considerable expense, frequently amounting to one-third of the original cost of

composition. It is evident, therefore, that with the limited funds allotted for printing for this Department, the practice should be discontinued without delay. It is believed that each Bureau, Division, or Office should be accepted as the authority in regard to the spelling and capitalization of the terms of the particular investigation with which it is concerned, and that its style should be followed when such terms appear in publications of other offices. There is also urgent necessity for uniformity in the spelling of words and terms in general use. These and many other questions might be satisfactorily settled by conferences of a board consisting of representatives from the various Bureaus, Divisions, and Offices, to be held as occasion requires, thus establishing in course of time a definite style for all the publications of the Department.

VARIATIONS IN SIZE OF PUBLICATIONS.

There is a disposition on the part of certain Bureaus, Divisions, and Offices to adopt the quarto or duodecimo size for their publications in place of the octavo, which has been the standard for many years. While there may be occasionally instances in which the departure is justifiable and necessary, it is believed that the change should never be made unless it can not possibly be avoided, as in the case of extensive and complicated tabular matter. Considerations of economy as well as convenience justify the continued use of the octavo size, which is particularly suitable for large editions and general distribution. The quarto, if used at all, should be confined to bulletins of an extremely scientific or technical character, which are usually issued in very limited editions. There is another serious objection to discrepancies in size in the publications, and that is the difficulty of binding them for permanent preservation and for reference. The different sizes can not be bound together, and even if bound separately they can not usually be shelved together in libraries or bookcases. On this account the duodecimo is as objectionable as the quarto. The size known as royal octavo seems to be very generally accepted as most satisfactory for scientific or technical publications.

NEED OF ADDITIONAL OFFICE ROOM.

I feel obliged again to refer to the inadequate quarters assigned to the use of this Division for the editorial force. An additional communicating room is very much needed for the use of the employees engaged in editorial work, proof reading, and indexing, all of which requires freedom from interruption. In the room now occupied, which also serves as the business office, nine employees are crowded, and their work is unavoidably interrupted by the almost perpetual distractions incident to the public business of the office. Furthermore, it is very necessary in the expedition of the work to have the entire force of editorial assistants in one room, or at least very near together, instead of being separated as they now are on different floors of the main building.

GENERAL CARD INDEX OF THE PUBLICATIONS.

With the rapid increase in the number of publications issued there is an increased necessity for the undertaking of the preparation of a card index of all the bulletins and reports, so as to make readily

available the information they contain. One person should constantly be employed at such work, which would result eventually in what might be called an index section or room, where the index should be maintained in cases of modern style, capable of enlargement as necessity required. All that the Division has been able to do along this line is to prepare and keep a card index of the available publications, which serves a very useful purpose.

APPENDIX A.

PUBLICATIONS ISSUED DURING THE YEAR ENDED JUNE 30, 1901.

[The following publications were issued during the year ended June 30, 1901. Those to which a price is attached, with the exception of publications of the Weather Bureau, must be obtained of the Superintendent of Documents, Union Building, Washington, D. C., to whom are turned over all copies not needed for official use, in compliance with section 67 of the act providing for the public printing and binding and the distribution of public documents. Remittances should be made to him by postal money order. Weather Bureau publications to which a price is attached must be obtained from the chief of that Bureau. Applications for those that are for free distribution should be made to the Secretary of Agriculture, Washington, D. C.]

OFFICE OF THE SECRETARY.

	Copies.
Marketing Farm Produce. By George G. Hill, formerly Manager and Editor of the American Farmer, Illinois. Pp. 28, figs. 7. Farmers' Bulletin No. 62. (Reprint.) July, 1900	15,000
Reprint, April, 1901	15,000
Work of the Breeder in Improving Live Stock. By John Clay, jr., Chicago, Ill. Pp. ii, 627–642, reprinted from Yearbook of Department of Agriculture for 1899. August, 1900	100
Development of Transportation in the United States. By Angus Sinclair, Editor Locomotive Engineering. Pp. ii, 643–663, reprinted from Yearbook of Department of Agriculture for 1899. August, 1900	100
Sheep and Wool: A Review of the Progress of American Sheep Husbandry. By J. R. Dodge, Special Agent. Pp. 63, figs. 3. Report No. 66. September, 1900. Price, 5 cents	5,000
Reprint, March, 1901	500
Report of the Secretary of Agriculture, 1900. Pp. 76. November, 1900	12,500
Cooperative Grass and Forage Plant Investigations with State Experiment Stations. By Thomas A. Williams, In Charge of Experiment Work. Pp. 14. Circular No. 8. December, 1900	2,500
Reprint, February, 1901	2,500
Report of the Assistant Secretary Upon the Purchase and Distribution of Seeds for 1900. By J. H. Brigham. Pp. ii, 3–6, from Annual Reports, Department of Agriculture, 1900. January, 1900	200
Collection and Distribution of Grass Seeds: Field Work. By C. L. Shear, In Charge of Seed and Field Work, Division of Agrostology. Pp. 11. Circular No. 9. January, 1901	3,500
Foreign Markets for American Agricultural Products. Testimony of Frank H. Hitchcock, Chief of the Section of Foreign Markets, before the Industrial Commission. Pp. 53. Report No. 67. February, 1901. Price, 5 cents	10,000
Catalase, a New Enzym of General Occurrence, with Special Reference to the Tobacco Plant. By Oscar Loew, Division of Vegetable Physiology and Pathology, detailed to the Division of Soils. Pp. 47. Report No. 68. March, 1901. Price, 5 cents	3,000
Cultivation of Tobacco in Sumatra. By Emile Mulder. Pp. 39. Report No. 58. (Reprint.) April, 1901. Price, 5 cents	1,000
Curing and Fermentation of Cigar Leaf Tobacco. By Oscar Loew, of the Division of Vegetable Physiology and Pathology. Pp. 34. Report No. 59. (Reprint.) April, 1901. Price, 5 cents	1,000

CONGRESSIONAL.

	Copies.
Report on the Big Trees of California. Prepared in the Division of Forestry, U. S. Department of Agriculture. Pp. 30, pls. 15, map. August, 1900. Price, 15 cents	1,000
Field Operations of the Division of Soils, with Accompanying Papers. By Thomas H. Means, Frank D. Gardner, Clarence W. Dorsey, Frank K. Cameron, Lyman J. Briggs. Pp. 198, pls. 29, figs. 19, maps 11. Cloth. (Report No. 64.) August, 1900. Price, 95 cents	13,000
Progress of the Beet Sugar Industry in the United States in 1899, With a Supplementary Report on the Cane-Sugar Industry of the Hawaiian Islands. By Charles F. Saylor, Special Agent, and H. W. Wiley, Chemist. U. S. Department of Agriculture. Pp. 200. (H. R. Doc. No. 699, 56th Cong., 1st sess.) September, 1900	8,000
A Primer of Forestry. Part 1. The Forest. Pp. 88, frontispiece, pls. 47, figs. 83. Bulletin No. 24, Division of Forestry. Second edition. October, 1900. Price, 35 cents	35,000
Peach Leaf Curl: Its Nature and Treatment. By Newton B. Pierce, in Charge of Pacific Coast Laboratory, Santa Ana, Cal. Pp. 204, pls. 30, figs. 10. Cloth. Bulletin No. 20, Division of Vegetable Physiology and Pathology. Congressional edition. November, 1900. Price, 30 cents	22,000
Annual Reports of the Department of Agriculture for the Fiscal Year Ended June 30, 1900. Pp. lxxviii, 297. Cloth. January, 1901	3,000
Irrigation Investigations in California. Under the direction of Elwood Mead, Expert in Charge of Irrigation Investigations of the Office of Experiment Stations, U. S. Department of Agriculture, assisted by William E. Smythe, Marsden Manson, J. M. Wilson, Charles D. Marx, Frank Soulé, C. E. Grunsky, Edward M. Boggs, and James D. Schuyler. Pp. 73. (Senate Doc. No. 108, 56th Cong., 2d sess.) February, 1901	1,722
Expenditures in the Department of Agriculture. Letter from the Secretary of Agriculture, Presenting a Detailed Statement of Expenditures for the Department for the year ending June 30, 1900. Pp. 247. (H. R. Doc. No. 29, 56th Cong., 2d sess.) February, 1901	1,800
Agricultural Resources and Capabilities of Porto Rico. By Seaman A. Knapp, Special Agent in Charge of Agricultural Investigations in Porto Rico. Pp. 32, pls. 7. (H. R. Doc. No. 171, 56th Cong., 2d sess.) February, 1901	1,800
Reprint. March, 1901	2,000
Operations of the Bureau of Animal Industry. Message from the President of the United States, transmitting a report by the Secretary of Agriculture of the Operations of the Bureau of Animal Industry of that Department for the fiscal year ended June 30, 1900. Pp. 84. (Senate Doc. No. 96, 56th Cong., 2nd sess.) March, 1901	1,722
Sixteenth Annual Report of the Bureau of Animal Industry for the year 1899. Pp. 790, pls. 41, figs. 45. Cloth. March, 1901. Price, 85 cents	30,000
Fourth Report on the Agricultural Investigations in Alaska, 1900. By C. C. Georgeson, M. S., Special Agent in Charge of Alaska Investigations. Pp. 83, pls. 24. (H. R. Doc. No. 335, 56th Cong., 2d sess.) April, 1901	8,000
Report on the Agricultural Resources and Capabilities of Hawaii. By W. C. Stubbs, Ph. D., Director Louisiana Agricultural Experiment Station. Pp. 100, frontispiece, pls. 27. (H. R. Doc. No. 368, 56th Cong., 2d sess.) April, 1901	1,800
Yearbook of the U. S. Department of Agriculture, 1900. Pp. 888, frontispiece, pls. 87, figs. 88. May, 1901. Price, 75 cents	500,000
The Agricultural Experiment Stations in the United States. By A. C. True and V. A. Clarke. The Paris Exposition, 1900. Prepared to Accompany the Experiment Station Exhibit. Contributed to by the Association of American Agricultural Colleges and Experiment Stations. Cloth. Pp. 636, frontispiece, pls. 153. Bulletin No. 80, Office of Experiment Stations. (Reprint.) June, 1901. Price, $1.25	2,000

DIVISION OF ACCOUNTS AND DISBURSEMENTS.

Report of the Chief of the Division of Accounts and Disbursements for 1900. By F. L. Evans. Pp. iii, 233-263, from Annual Reports, Department of Agriculture, 1900. January, 1901	200
Fiscal Regulations of the U. S. Department of Agriculture, Together with Extracts from the Revised Statutes, Decisions of Courts, Rulings of the Comptrollers, Opinions of the Attorneys-General, etc. Pp. 49. Revised edition. June, 1901	3,000

DIVISION OF AGROSTOLOGY.

Copies.

Fodder and Forage Plants Exclusive of the Grasses. By Jared G. Smith, Assistant, Section of Seed and Plant Introduction. Prepared under the direction of F. Lamson-Scribner, Agrostologist. Pp. 86, pls. 2, figs. 46. Bulletin No. 2. Revised edition. July, 1900. Price, 5 cents 5,000

American Grasses—I. (Illustrated.) Descriptions of the Species. By F. Lamson-Scribner, Agrostologist. Pp. 319, figs. 302. Bulletin No. 7. Third edition. July, 1900. Price, 30 cents 1,000

Studies on American Grasses. A Revision of the North American Species of Bromus Occurring North of Mexico. By Cornelius L. Shear, Assistant Agrostologist. Pp. 66, figs. 40. Bulletin No. 23. July, 1900. Price, 5 cents 3,000

Grasses as Sand and Soil Binders. By F. Lamson-Scribner, B. Sc., Agrostologist. Pp. iii, 421-436, figs. 11, reprinted from Yearbook of Department of Agriculture for 1894. August, 1900 2,000

Progress of Economic and Scientific Agrostology. By F. Lamson-Scribner, B. Sc., Agrostologist. Pp. iii, 347-366, figs. 5, reprinted from Yearbook of Department of Agriculture for 1899. August, 1900 2,000

Succulent Forage for the Farm and Dairy. By Thomas A. Williams, Assistant Agrostologist. Pp. ii, 613-626, reprinted from Yearbook of Department of Agriculture for 1899. August, 1900 3,000

Turkestan Alfalfa. By P. Beveridge Kennedy, Expert and Agent in Charge of Experiment Work. Pp. 20, Circular No. 25. (Reprint.) September, 1900 10,000

Southern Forage Plants. Compiled from the Publications of the Division of Agrostology by F. Lamson-Scribner, Agrostologist. Pp. 48, figs. 14. Farmers' Bulletin No. 102. (Reprint.) September, 1900 10,000
Reprint, April, 1901 15,000

Sorghum as a Forage Crop. By Thomas A. Williams, Assistant Agrostologist. Prepared under the direction of the Agrostologist. Pp. 20, fig. 1. Farmers' Bulletin No. 50. (Reprint.) October, 1900 15,000
Reprint, May, 1901 30,000

Millets. By Thomas A. Williams, Assistant Agrostologist. Pp. 28, figs. 6. Farmers' Bulletin No. 101. (Reprint.) October, 1900 15,000

American Grasses—III. (Illustrated.) Descriptions of the Tribes and Genera. By F. Lamson-Scribner, Agrostologist. Pp. 197, figs. 137. Bulletin No. 20. Revised edition. November, 1900. Price, 15 cents 1,000

Agrostological Notes. By F. Lamson-Scribner and Elmer D. Merrill. Pp. 10. Circular No. 27. December, 1900 2,000

Studies on American Grasses.—I. Some Recent Collections of Mexican Grasses. By F. Lamson-Scribner and Elmer D. Merrill. II. Notes on *Panicum nitidum* Lam., *Panicum scoparium* Lam., and *Panicum pubescens* Lam. By F. Lamson-Scribner and Elmer D. Merrill. III. Miscellaneous Notes and Descriptions of New Species. By F. Lamson-Scribner and Carleton R. Ball. Pp. 55, figs. 23. Bulletin No. 24. January, 1901. Price, 5 cents 3,000

Grasses and Fodder Plants on the Potomac Flats. By C. R. Ball, Assistant in Charge of Grass Gardens and Experiments within the District of Columbia. Pp. 18. Circular No. 28. January, 1901 5,000

Report of the Agrostologist for 1900. By F. Lamson-Scribner. Pp. ii, 83-90, from Annual Reports, Department of Agriculture, 1899. January, 1901 1,000

Alfalfa or Lucern. By Jared G. Smith, Assistant Agrostologist. Pp. 24, figs. 3. Farmers' Bulletin No. 31. (Reprint.) January, 1901 20,000

The Grasses in Elliott's Sketch of the Botany of South Carolina and Georgia. By F. Lamson-Scribner, Agrostologist. Pp. 12, figs. 4. Circular No. 29. February, 1901 2,500

New or Little Known Grasses. By F. Lamson-Scribner, Agrostologist. Pp. 8. Circular No. 30. March, 1901 2,500

Bermuda Grass. By A. S. Hitchcock, Assistant Agrostologist. Pp. 6, figs. 2. Circular No. 31. April, 1901 5,000

Some Arizona Grasses. By Elmer D. Merrill, Assistant in Charge of Collections. Pp. 10. Circular No. 32. April, 1901 2,500

Range Grass and Forage Experiments at Highmore, S. Dak. Report of Progress. By F. Lamson-Scribner, Agrostologist. Pp. 5. Circular No. 33. April, 1901 3,000

Meadows and Pastures: Formation and Cultivation in the Middle Eastern States. By Jared G. Smith, Assistant Agrostologist. Pp. 28, figs. 9. Farmers' Bulletin No. 66. (Reprint.) April, 1901 30,000

Copies.

Cowpeas. By Jared G. Smith, Assistant Agrostologist. Pp. 16, fig. 1. Farmers' Bulletin No. 89. (Reprint.) April, 1901 30,000

American Grasses. II. (Illustrated.) By F. Lamson-Scribner, Agrostologist. Pp. 349, figs. 325. Bulletin No. 17. Revised edition. May, 1901. Price, 20 cents 1,000

The Cultivated Vetches. By Jared G. Smith, Assistant Agrostologist. Pp. 8, figs. 6. Circular No. 6. Revised. (Reprint.) May, 1901 5,000

Aristida Purpurea (Nutt.) and Its Allies. By Elmer D. Merrill, Assistant in Charge of Collections. Pp. 8. Circular No. 34. May, 1901 2,500

Agrostological Notes. By F. Lamson-Scribner, Agrostologist, and Elmer D. Merrill. Pp. 6. Circular No. 35. June, 1901 2,500

BUREAU OF ANIMAL INDUSTRY.

Some Examples of the Development of Knowledge Concerning Animal Diseases. By D. E. Salmon, D. V. M., Chief of the Bureau of Animal Industry. Pp. iii, 93–134, reprinted from Yearbook of Department of Agriculture for 1899. July, 1900 500

Dairy Development in the United States. By Henry E. Alvord, C. E., Chief of Dairy Division, Bureau of Animal Industry. Pp. v, 381–402, pls. 8, figs. 12, reprinted from Yearbook of Department of Agriculture for 1899. July, 1900 8,000

Administrative Work of the Federal Government in Relation to the Animal Industry. By George F. Thompson, Editorial Clerk, Bureau of Animal Industry. Pp. iii, 441–464, reprinted from Yearbook of Department of Agriculture for 1899. July, 1900 500

Hog Cholera and Swine Plague. By D. E. Salmon, D. V. M., Chief of the Bureau of Animal Industry. Pp. 16. Farmers' Bulletin No. 24. (Reprint.) July, 1900 15,000
Reprint. September, 1900 15,000
Reprint, April, 1901 15,000

Facts About Milk. By R. A. Pearson, B. S., Assistant Chief, Dairy Division, Bureau of Animal Industry. Pp. 29, figs. 8. Farmers' Bulletin No. 42. (Reprint.) August, 1900 10,000
Reprint, November, 1900 15,000
Reprint, April, 1901 30,000

The Dairy Herd: Its Formation and Management. By Henry E. Alvord, Chief of Dairy Division, Bureau of Animal Industry. (Reprinted, with revision by the author, from the Yearbook of the Department of Agriculture for 1894.) Pp. 24. Farmers' Bulletin No. 55. (Reprint.) August, 1900 15,000
Reprint, February, 1901 30,000

Ducks and Geese: Standard Breeds and Management. By George E. Howard, Secretary of National Poultry and Pigeon Association. Pp. 48, figs. 37. Farmers' Bulletin No. 64. (Reprint.) August, 1900 10,000
Reprint. March, 1901 15,000

Breeds of Dairy Cattle. By Henry E. Alvord, C. E., Chief of Dairy Division, Bureau of Animal Industry. (Reprinted from the Report of the Bureau of Animal Industry for 1898.) Pp. 48, figs. 41. Farmers' Bulletin No. 106. (Reprint.) August, 1900 15,000
Reprint, August, 1900 15,000
Reprint, January, 1901 20,000
Reprint, April, 1901 30,000
Reprint, May, 1901 30,000

Rabies: Report of the Committee on Public Health of the Medical Society of the District of Columbia. Pp. 29. Bulletin No. 25. September, 1900. Price, 5 cents 3,000

Directions for the Use of Blackleg Vaccine. By Victor Nörgaard, Chief of Pathological Division, Bureau of Animal Industry. Pp. 8, figs. 3. Circular No. 23. Second revision. (Reprint.) September, 1900 10,000
Reprint, February, 1901 20,000

Butter Making on the Farm. By C. P. Goodrich, Dairy Instructor, Farmers' Institute Department, University of Wisconsin. Under supervision of the Dairy Division, Bureau of Animal Industry. Pp. 16. Farmers' Bulletin No. 57. (Reprint.) September, 1900 10,000
Reprint, November, 1900 15,000
Reprint, May, 1901 30,000

Copies.

Raising Sheep for Mutton. By Charles F. Curtiss, Director of the Iowa Agricultural Experiment Station. Pp. 48, figs. 18. Farmers' Bulletin No. 96. (Reprint.) September, 1900 10,000
Reprint, January, 1901 20,000

Blackleg. Its Nature, Cause, and Prevention. By Victor A. Norgaard, Chief of Pathological Division, Bureau of Animal Industry. Pp. 23, fig. 1. Circular 31. Revised edition. November, 1900 10,000

Experiments with Texas Fever and Southern Cattle Ticks. Growing Noninfected Ticks and Afterwards Infecting Them. By E. C. Schroeder. A note on the Vitality of the Southern Cattle Tick. By E. C. Schroeder. A note on the Persistence of the Texas Fever Organism in the Blood of Cattle. By E. C. Schroeder. An Experiment in Blood and Serum Injections in Connection with Texas Fever Investigations. By E. C. Schroeder. Pp. 33-52. (Reprinted from Sixteenth Annual Report of the Bureau of Animal Industry, 1899.) November, 1900 2,000

Report Upon Experimental Exports of Butter, 1898-99. By Henry E. Alvord, C. E., Chief of Dairy Division. Pp. 154-243. (Reprinted from Sixteenth Annual Report of the Bureau of Animal Industry, 1899.) November, 1900 12,000

Statistics of Oleomargarine, Oleo Oil, and Filled Cheese. By R. A. Pearson, M. S., Assistant Chief of Dairy Division. Pp. ii, 287-320, diagram 1. (Reprinted from Sixteenth Annual Report of the Bureau of Animal Industry, 1899.) November, 1900 6,000

A Report Upon the Examination of Milk. By E. A. de Schweinitz. The International Congress for the Consideration of the Best Methods for Checking or Curing Tuberculosis. By E. A. de Schweinitz. Culture Media for Biochemic Investigations. By E. A. de Schweinitz. Pp. 147-153, 126-133, 145, 146. (Reprinted from the Sixteenth Annual Report of the Bureau of Animal Industry, 1899.) November, 1900 2,000

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Monthly List of Publications.	April, 1901. Pp. 8	57,000
Monthly List of Publications.	May, 1901. Pp. 4	58,000

OFFICE OF PUBLIC ROAD INQUIRIES.

Road Improvement in New York. Pp. 15. Circular No. 35. July, 1900	10,000
Progress of Road Building in the United States. By Maurice O. Eldridge, Acting Director of the Office of Public Road Inquiries. Pp. ii, 367–380, reprinted from Yearbook of Department of Agriculture for 1899. July, 1900	3,000
Good Roads For Farmers. By Maurice O. Eldridge, Acting Director, Office of Public Road Inquiries. Pp. 47, figs. 49. Farmers' Bulletin No. 95. (Reprint.) July, 1900	15,000
Reprint, September, 1900	15,000
Reprint, January, 1901	20,000
Reprint, March, 1901	50,000
Steel Track Wagon Roads. By Martin Dodge, Director of the Office of Road Inquiry. Pp. ii, 291–296, reprinted from Yearbook of Department of Agriculture for 1898. (Reprint.) October, 1900	1,000
Construction of Good Country Roads. By Maurice O. Eldridge, Assistant in Office of Road Inquiry. Pp. ii, 317–324, reprinted from Yearbook of Department of Agriculture for 1898. (Reprint.) October, 1900	1,000
Earth Roads. Hints on Their Construction and Repair. Compiled by Roy Stone, Special Agent in Charge of Road Inquiry. Pp. 20, figs. 11. Bulletin No. 8. (Reprint.) November, 1900. Price, 5 cents	2,500
State Aid to Road Building in New Jersey. By Edward Burrough, Chairman of the New Jersey State Board of Agriculture and State Commissioner of Public Roads. Pp. 20. Bulletin No. 9. November, 1900. (Reprint.) Price, 5 cents	1,500
Wide Tires. Laws of Certain States Relating to Their Use, and Other Pertinent Information. Compiled by Roy Stone, Special Agent in Charge of Road Inquiry. Pp. 16. Bulletin No. 12. (Reprint.) November, 1900. Price, 5 cents	1,500
Historical and Technical Papers on Road Building in the United States. Compiled under Direction of Roy Stone. Special Agent and Engineer. Pp. 52. Bulletin No. 17. (Reprint.) November, 1900. Price 5 cents	5,000
Report of the Director of the Office of Public Road Inquiries for 1900. By Martin Dodge. Pp. ii, 279–291, from Annual Reports, Department of Agriculture, 1900. January, 1901	1,000

SECTION OF SEED AND PLANT INTRODUCTION.

The Cultivation of Znaim Cucumbers. By David G. Fairchild, Agricultural Explorer. Pp. 4. Circular No. 2. January, 1901	2,500
Inventory No. 8. Seeds and Plants Imported for Distribution in Cooperation with the Agricultural Experiment Stations. Numbers 3401–4350. Pp. 106. January, 1901	2,000
The Best Horse Radish Varieties of Europe and Methods of Cultivation. By David G. Fairchild, Agricultural Explorer. Pp. 8, figs. 4. Circular No. 1. February, 1901	3,000

DIVISION OF SOILS.

Description of a Soil Map of the Connecticut Valley. Pp. 4. Circular No. 7. July, 1900	500
Soil Investigations in the United States. By Milton Whitney, Chief of Division of Soils. Pp. iii, 335–346, reprinted from Yearbook of Department of Agriculture for 1899. July, 1900	2,000
Growth of the Tobacco Industry. By Milton Whitney, Chief, and Marcus L. Floyd, Tobacco Expert, Division of Soils. Pp. iii, 429–440, pls. 7, reprinted from Yearbook of Department of Agriculture for 1899. August, 1900	5,000
A Soil Survey in Salt Lake Valley, Utah. By Frank D. Gardner and John Stewart. Pp. 77–114, pls. 11, figs. 5, maps 4, reprinted from Report No. 64. August, 1900	5,000

	Copies.
Application of the Theory of Solution to the Study of Soils. By Frank K. Cameron, reprinted from Report No. 64 of the Department of Agriculture. (Field Operations of the Division of Soils, 1899.) Pp. iii, 141–172. August, 1900	300
Salts as Influencing the Rate of Evaporation of Water from Soils. By Lyman J. Briggs, reprinted from Report No. 64 of the Department of Agriculture. (Field Operations of the Division of Soils, 1899.) Pp. 173–183, pl. 1, fig. 1. August, 1900	250
Some Necessary Modifications in Methods of Mechanical Analysis as Applied to Alkali Soils. By Lyman J. Briggs, reprinted from Report No. 64 of the Department of Agriculture. (Field Operations of the Division of Soils, 1899.) Pp. iii, 184–198, pl. 1, figs. 8. August, 1900	300
The Movement and Retention of Water in Soils. By Lyman J. Briggs, Assistant Chief of Division of Soils. Pp. ii, 399–404, figs. 7, reprinted from Yearbook of Department of Agriculture for 1898. (Reprint.) September, 1900	1,000
The Soluble Mineral Matter of Soils. By Thomas H. Means, Assistant, Division of Soils. Pp. ii, 495–504, reprinted from the Yearbook of the Department of Agriculture for 1898. (Reprint.) September, 1900	1,000
Soil Survey in the Connecticut Valley. By Clarence W. Dorsey and J. A. Bonsteel. Pp. iii, 125–140, pls. 7, map, reprinted from Report No. 64 of the Department of Agriculture. (Field Operations of the Division of Soils for 1899.) September, 1900	1,500
Farm Drainage. By C. G. Elliott, C. E., member of the American Society of Civil Engineers, Peoria, Ill. Pp. 24, figs. 6. Farmers' Bulletin No. 40. (Reprint.) October, 1900	15,000
Reprint, April, 1901	40,000
Report of the Chief of the Division of Soils for 1900. By Milton Whitney. Pp. iii, 67–83, fig. 1, from Annual Reports, Department of Agriculture, 1900. November, 1900	2,000
Soil Solutions: Their Nature and Functions, and the Classifications of Alkali Lands. By Frank K. Cameron, Soil Chemist, Division of Soils (cooperating with the Division of Chemistry). Pp. 37. Bulletin No. 17. May, 1901. Price, 5 cents	2,000

DIVISION OF STATISTICS.

Progress of Agriculture in the United States. By George K. Holmes, Assistant Statistician. Pp. iii, 307–334, reprinted from Yearbook of the Department of Agriculture for 1899. July, 1900					3,000
Changes in Railroad Freight Classifications. By Edward G. Ward, jr., of the Division of Statistics. Pp. 43. Circular No. 12. August, 1900					8,000
List of Free Employment Agencies for the Use of Farmers. Pp. 42. Circular No. 13. October, 1900					10,000
Estimates of Russian Crops. By E. T. Peters, of the Division of Statistics. Pp. 10, map. Circular No. 14. February, 1901					6,000
The Cotton Crop of 1899–1900. By James L. Watkins, Division of Statistics. Pp. 46. Miscellaneous Series, Bulletin No. 19. May, 1901. Price, 5 cents					7,000
The Course of Prices of Farm Implements and Machinery for a Series of Years. By George K. Holmes, of the Division of Statistics. Pp. 31. Miscellaneous Series, Bulletin No. 18. June, 1901. Price, 5 cents					30,000
Crop Reporter.	Vol. 2, No. 3.	Pp. 8.	July, 1900		60,000
Crop Reporter.	Vol. 2, No. 4.	Pp. 8.	August, 1900		225,000
Crop Reporter.	Vol. 2, No. 4.	Pp. 4.	August, 1900. Supplement		7,000
Crop Reporter.	Vol. 2, No. 5.	Pp. 8.	September, 1900		225,000
Crop Reporter.	Vol. 2, No. 6.	Pp. 8.	October, 1900		215,000
Crop Reporter.	Vol. 2, No. 7.	Pp. 8.	November, 1900		90,000
Crop Reporter.	Vol. 2, No. 8.	Pp. 4.	December, 1900		90,000
Crop Reporter.	Vol. 2, No. 9.	Pp. 8.	January, 1901		80,000
Crop Reporter.	Vol. 2, No. 9.	Pp. 8.	January, 1901. Additional		15,000
Crop Reporter.	Vol. 2, No. 10.	Pp. 8.	February, 1901		95,000
Crop Reporter.	Vol. 2, No. 11.	Pp. 8.	March, 1901		82,000
Crop Reporter.	Vol. 2, No. 12.	Pp. 8.	April, 1901		85,000
Crop Reporter.	Vol. 3, No. 1.	Pp. 8.	May, 1901		85,000
Crop Reporter.	Vol. 3, No. 2.	Pp. 8.	June, 1901		85,000

DIVISION OF VEGETABLE PHYSIOLOGY AND PATHOLOGY.

Copies.

Peach Leaf Curl: Its Nature and Treatment. By Newton B. Pierce, in Charge of Pacific Coast Laboratory, Santa Ana, Cal. Pp. 204, pls. 30, figs. 10. Bulletin No. 20. July, 1900. Price, 20 cents 1,000

The Cause and Prevention of Pear Blight. By M. B. Waite, Assistant, Division of Vegetable Physiology and Pathology, U. S. Department of Agriculture. Pp. 295–300, reprinted from Yearbook of the Department of Agriculture for 1895. (Reprint.) July, 1900 5,000

Progress in the Treatment of Plant Diseases in the United States. By B. T. Galloway, Chief of Division of Vegetable Physiology and Pathology. Pp. iii, 191–199, reprinted from Yearbook of Department of Agriculture for 1899. August, 1900 3,000

Progress of Plant Breeding in the United States. By Herbert J. Webber and Ernst A. Bessey, Division of Vegetable Physiology and Pathology. Pp. iii, 465–490, pls. 3, figs. 2, reprinted from Yearbook of Department of Agriculture for 1899. August, 1900 3,000

Progress of Commercial Growing of Plants Under Glass. By B. T. Galloway, Chief of Division of Vegetable Physiology and Pathology. Pp. iii, 575–590, reprinted from Yearbook of Department of Agriculture for 1899. August, 1900 6,000

Two Diseases of Red Cedar, Caused by *Polyporus juniperinus* n. sp. and *Polyporus carneus* Nees. A Preliminary Report by Hermann von Schrenk, Instructor in Botany, Henry Shaw School of Botany, Special Agent, Division of Vegetable Physiology and Pathology. Pp. 27, pls. 7, figs. 3. Bulletin No. 21. September, 1900. Price, 10 cents 5,000

Xenia, or the Immediate Effect of Pollen, in Maize. By Herbert J. Webber, in Charge of Plant Breeding Laboratory. Pp. 44, pls. 4. Bulletin No. 22. September, 1900. Price, 10 cents 2,500

Peach Yellows and Peach Rosette. By Erwin F. Smith, Special Agent, under the Direction of B. T. Galloway, Chief of the Division of Vegetable Pathology. Pp. 20, figs. 7. Farmers' Bulletin No. 17. (Reprint.) September, 1900 5,000
Reprint, February, 1901 15,000

Spot Disease of the Violet (*Alternaria violæ* n. sp.). By P. H. Dorsett, Associate, Division of Vegetable Physiology and Pathology. Pp. 16, pls. 7. Bulletin No. 23. November, 1900. Price, 10 cents 2,500

The Basis for the Improvement of American Wheat. By Mark Alfred Carleton, Cerealist, Division of Vegetable Physiology and Pathology. Pp. 87, frontispiece, pls. 10, figs. 5. Bulletin No. 24. December, 1900. Price, 10 cents 2,000
Reprint, March, 1901 1,500

Some Diseases of New England Conifers: A Preliminary Report. By Hermann von Schrenk, Instructor in Botany, Henry Shaw School of Botany, Special Agent Division of Vegetable Physiology and Pathology. Pp. 56, pls. 15, figs. 3. Bulletin No. 25. December, 1900. Price, 10 cents 2,000

The Wilt Disease of Cotton and Its Control. By W. A. Orton, Associate Pathologist. Pp. 16, pls. 4. Bulletin No. 27. December, 1900. Price, 5 cents 4,000

Report of the Chief of the Division of Vegetable Physiology and Pathology for 1900. By B. T. Galloway. Pp. ii, 49–58, from Annual Reports, Department of Agriculture, 1900. January, 1901 500

Spraying for Fruit Diseases. By B. T. Galloway, Chief of Division of Vegetable Physiology and Pathology. Pp. 12, figs. 6. Farmers' Bulletin No. 38. (Reprint.) January, 1901 20,000

Potato Diseases and Their Treatment. By B. T. Galloway, Chief, Division of Vegetable Physiology and Pathology. Pp. 12, figs. 4. Farmers' Bulletin No. 91. (Reprint.) January, 1901 20,000
Reprint, May, 1901 20,000

Wakker's Hyacinth Germ, *Pseudomonas hyacinthi* (Wakker). By Erwin F. Smith, in Charge of Laboratory of Plant Pathology. Pp. 45, pl. 1, figs. 6. Bulletin No. 26. February, 1901. Price, 5 cents 2,700

Grape Diseases on the Pacific Coast. By Newton B. Pierce, Division of Vegetable Physiology and Pathology. Pp. 15, figs. 3. Farmers' Bulletin No. 30. (Reprint.) April, 1901 10,000

Peach Growing for Market. By Erwin F. Smith, Division of Vegetable Physiology and Pathology. Pp. 24, figs. 21. Farmers' Bulletin No. 33. April, 1901 30,000

Copies.

The Grain Smuts: How They Are Caused and How to Prevent Them. By Walter T. Swingle, Special Agent, Division of Vegetable Physiology and Pathology. Pp. 20, figs. 8. Farmers' Bulletin No. 75. (Reprint.) April 1, 1901 30,000

WEATHER BUREAU.

Monthly Weather Review (a summary by months of weather conditions throughout the United States, based upon reports of nearly 3,000 regular and voluntary observers). Quarto. Price, 10 cents each; 20 cents from January, 1901.

Vol. XXVIII, No. 5. May, 1900. Pp. 193–238, charts 8 4,450
Vol. XXVIII, No. 6. June, 1900. Pp. 239–278, charts 8 4,450
Vol. XXVIII, No. 7. July, 1900. Pp. 279–320, pls. 3, charts 8 4,450
Vol. XXVIII, No. 8. August, 1900. Pp. 321–370, figs. 4, charts 8 4,450
Vol. XXVIII, No. 9. September, 1900. Pp. 371–424, fig. 1, charts 13 4,450
Vol. XXVIII, No. 10. October, 1900. Pp. 425–476, figs. 17, charts 10 4,450
Vol. XXVIII, No. 11. November, 1900. Pp. 477–525, pls. 2, charts 10 4,450
Vol. XXVIII, No. 12. December, 1900. Pp. 527–583, pl. 1, charts 10 4,450
Vol. XXVIII, No. 13. Annual Summary. Pp. 585–599, charts 7 4,450
Vol. XXIX, No. 1. January, 1901. Pp. 1–47, pls. 2, charts 10 4,450
Vol. XXIX, No. 2. February, 1901. Pp. 49–97, pls. 5, charts 13, figs. 10 4,450
Vol. XXIX, No. 3. March, 1901. Pp. 99–143, pl. 1, charts 9 4,450

Meteorological Chart of the Great Lakes for June, 1900 3,000
Meteorological Chart of the Great Lakes for July, 1900 3,000
Meteorological Chart of the Great Lakes for August, 1900 3,000
Meteorological Chart of the Great Lakes for November, 1900 3,000
Meteorological Chart of the Great Lakes for December, 1900 3,000

Report of the Chief of the Weather Bureau, 1898–99. Part II. Climatology. Hourly Averages of Atmospheric Pressure, Temperature, and Wind from the Records of Automatic Instruments at Twenty-eight Stations. Pp. 15–69. July, 1900 50

Report of the Chief of the Weather Bureau, 1898–99. Part III. Climatology. Monthly and Annual Meteorological Summaries. Pp. 71–153. July, 1900 500

Report of the Chief of the Weather Bureau, 1898–99. Part IV. Climatology. Monthly Annual Mean Temperature and Annual Extremes of Temperature, Together with the Dates of First and Last Killing Frost. Pp. 155–190. July, 1900 100

Tables of Daily and Monthly Precipitation. Pp. 256. August, 1900 1,600

Work of the Meteorologist for the Benefit of Agriculture, Commerce, and Navigation. By F. H. Bigelow, Professor of Meteorology, Weather Bureau. Pp. ii, 71–92, pls. 2. August, 1900 2,000

Atmo pheric Radiation: A Research Conducted at the Allegheny Observatory and at Providence, R. I. Submitted to Willis L. Moore, Chief of U. S. Weather Bureau, by Frank W. Very. Pp. 134. Bulletin G. September, 1900 2,000

Report of the Chief of the Weather Bureau, 1898–99. (In two volumes.) Volume II. Pp. 787, charts 79. Report on the International Cloud Observations. May 1, 1896, to July, 1897. November, 1900 4,000

Notes on Frost. By E. B. Garriott, Professor of Meteorology, Weather Bureau. Pp. 24, Farmers' Bulletin No. 104. November, 1900 15,000
Reprint, April, 1901 30,000

Daily River Stages at River Gage Stations on the Principal Rivers of the United States. Part VI. For the Years 1896, 1897, 1898, and 1899. Prepared under direction of Willis L. Moore, Chief of Bureau, by H. C. Frankenfeld, Forecast Official. Pp. 83. (W. B., No. 227.) November, 1900 400

Climatic Charts of the United States. In Six Parts: I. Washington Daily Weather Maps. II. Normal Precipitation. III. Normal Sunshine. IV. Normal Barometric Pressure. V. Normal Temperature of the Air at the Surface of the Earth. VI. Temperature. (These charts are for the exclusive use of Weather Bureau Stations, and not for general distribution.) September, 1900 200

West Indian Hurricanes. By E. B. Garriott, Professor of Meteorology. Prepared under direction of Willis L. Moore, Chief, U. S. Weather Bureau. Pp. 69, chart 7. (W. B., No. 232.) December, 1900. Price, 15 cents 2,000

Copies.

Report of the Chief of the Weather Bureau for 1900. By Willis L. Moore. Pp. 15, from Annual Reports, Department of Agriculture, 1900. December, 1900 1,000

Anemometer. A Circular of General Information Respecting the Theory and Operation of Instruments for Indicating, Measuring, and Automatically Recording Wind Movement and Direction, With Instructions for the Erection and Care of Such Instruments of the Weather Bureau Pattern. By C. F. Marvin, Professor of Meteorology. Prepared under direction of Willis L. Moore, Chief, U. S. Weather Bureau. Pp. 67, figs. 28, Circular D, Instrument Division. Second edition. January, 1901 .. 1,500

Psychrometric Tables for Obtaining the Vapor Pressure, Relative Humidity, and Temperature of the Dew Point. From Readings of the Wet and Dry Bulb Thermometers. Prepared under the direction of Willis L. Moore, Chief of the Weather Bureau, by C. F. Marvin, Professor of Meteorology. Pp. 84. January, 1901. Price, 10 cents 5,000

Protection of Food Products from Injurious Temperatures. By H. E. Williams, Chief Clerk, Weather Bureau. Pp. 26. Farmers' Bulletin, No. 125. February, 1901 20,000

Meteorological Chart of the Great Lakes. Vol. III, No. 10. By Alfred J. Henry and Norman B. Conger. Prepared under direction of Willis L. Moore, Chief, U. S. Weather Bureau. Pp. 23, charts 14. (W. B., No. 237.) February, 1901 2,300

Report of the Chief of the Weather Bureau, 1899–1900. Part II. Climatology. Hourly Averages of Atmospheric Pressure, Temperature, and Wind from the Records of Automatic Instruments at Twenty-eight Stations. Pp. 17–71. April, 1901 50

Report of the Chief of the Weather Bureau, 1899–1900. Part III. Climatology. Monthly and Annual Meteorological Summaries. Pp. 73–161. April, 1901 500

Report of the Chief of the Weather Bureau, 1899–1900. Part IV. Climatology. Monthly and Annual Temperature and Annual Extremes of Temperature, Together with the Dates of First Killing Frost, 1899. Pp. 163–199. April, 1901 200

Report of the Chief of the Weather Bureau, 1899–1900. Part V. Climatology. Monthly and Annual Precipitation, 1899. All Stations. Pp. 201–258. April, 1901 200

Report of the Chief of the Weather Bureau, 1899–1900. Part VI. Climatology. Miscellaneous Meteorological Tables and Reports. Pp. 259–347. April, 1901 250

Report of the Chief of the Weather Bureau, 1899–1900. Part VII. Meteorological Observations of the Second Wellman Expedition, by Evelyn B. Baldwin, Observer, Weather Bureau. Pp. 349–436. April, 1901 500

Barometers and the Measurement of Atmospheric Pressure. By C. F. Marvin, Professor of Meteorology. Prepared under the direction of Willis L. Moore, Chief, U. S. Weather Bureau. Pp. 94, figs. 23. Circular F, Instrument Division, Second edition. April, 1901. (W. B., No. 241.) Price, 15 cents 1,500

Report of Chief of Weather Bureau, 1899–1900. By Willis L. Moore. Pp. 436. Cloth. May, 1901 1,000

Meteorological Chart of the Great Lakes. No. 1, 1901. By Alfred J. Henry and Norman B. Conger. Prepared under the direction of Willis L. Moore, Chief U. S. Weather Bureau. Pp. 28, charts 4. (W. B., No. 244.) June, 1901 3,000

Climate and Crop Bulletin No. 16. July 2, 1900 4,100

Climate and Crop Bulletin No. 17. July 9, 1900 4,100

Climate and Crop Bulletin No. 18. July 16, 1900 4,100

Climate and Crop Bulletin No. 19. July 23, 1900 4,100

Climate and Crop Bulletin No. 20. July 30, 1900 4,100

Climate and Crop Bulletin No. 21. August 6, 1900 4,100

Climate and Crop Bulletin No. 22. August 13, 1900 4,100

Climate and Crop Bulletin No. 23. August 20, 1900 4,100

Climate and Crop Bulletin No. 24. August 27, 1900 4,100

Climate and Crop Bulletin No. 25. September 3, 1900 4,100

Climate and Crop Bulletin No. 26. September 10, 1900 4,150

Climate and Crop Bulletin No. 27. September 17, 1900 4,100

Climate and Crop Bulletin No. 28. September 24, 1900 4,100

Climate and Crop Bulletin No. 29. October 1, 1900 4,150

		Copies.
Climate and Crop Bulletin No. 30.	October, 1900	4,450
Climate and Crop Bulletin No. 31.	November, 1900	4,600
Climate and Crop Bulletin No. 32.	December, 1900	4,600
Climate and Crop Bulletin No. 1.	January, 1901	4,650
Climate and Crop Bulletin No. 2.	February, 1901	4,600
Climate and Crop Bulletin No. 3.	March, 1901	4,650
Climate and Crop Bulletin No. 4.	April 8, 1901	4,650
Climate and Crop Bulletin No. 5.	April 15, 1901	4,650
Climate and Crop Bulletin No. 6.	April 22, 1901	4,300
Climate and Crop Bulletin No. 7.	April 29, 1901	4,300
Climate and Crop Bulletin No. 8.	May 6, 1901	4,300
Climate and Crop Bulletin No. 9.	May 13, 1901	4,300
Climate and Crop Bulletin No. 10.	May 20, 1901	4,400
Climate and Crop Bulletin No. 11.	May 27, 1901	4,300
Climate and Crop Bulletin No. 12.	June 3, 1901	4,350
Climate and Crop Bulletin No. 13.	June 10, 1901	4,350
Climate and Crop Bulletin No. 14.	June 17, 1901	4,350
Climate and Crop Bulletin No. 15.	June 24, 1901	4,350
Storm Bulletin No. 1, 1900.	West Indian Hurricane, September 1-10, 1900	425
Snow and Ice Bulletin.	December 4, 1900	1,600
Snow and Ice Bulletin.	December 11, 1900	1,600
Snow and Ice Bulletin.	December 18, 1900	1,600
Snow and Ice Bulletin.	December 25, 1900	1,600
Snow and Ice Bulletin.	January 2, 1901	1,600
Snow and Ice Bulletin.	January 8, 1901	1,600
Snow and Ice Bulletin.	January 15, 1901	1,770
Snow and Ice Bulletin.	January 22, 1901	1,770
Snow and Ice Bulletin.	January 29, 1901	1,770
Snow and Ice Bulletin.	February 5, 1901	1,800
Snow and Ice Bulletin.	February 12, 1901	1,800
Snow and Ice Bulletin.	February 19, 1901	1,800
Snow and Ice Bulletin.	February 26, 1901	1,800
Snow and Ice Bulletin.	March 5, 1901	1,850
Snow and Ice Bulletin.	March 12, 1901	1,850
Snow and Ice Bulletin.	March 19, 1901	1,850
Snow and Ice Bulletin.	March 26, 1901	1,850
Daily weather map (showing weather conditions throughout the United States and giving forecasts of probable changes):		
	July, 1900	36,600
	August, 1900	46,520
	September, 1900	43,840
	October, 1900	47,556
	November, 1900	44,418
	December, 1900	45,768
	January, 1901	46,888
	February, 1901	43,920
	March, 1901	47,238
	April, 1901	48,030
	May, 1901	48,080
	June, 1901	45,940

APPENDIX B.

REPORT IN DETAIL OF PUBLICATIONS OF THE U. S. DEPARTMENT OF AGRICULTURE RECEIVED AND DISTRIBUTED DURING THE FISCAL YEAR ENDED JUNE 30, 1901.

[NOTE.—The publications of the Weather Bureau are not distributed from the Division of Publications, but by an official in that Bureau specially charged with such work and directed by the order of the Secretary of Agriculture, dated March 29, 1897, to report to the chief of this Division. A list of Weather Bureau publications is given in separate tables.]

Publications other than Farmers' Bulletins received and distributed from July 1, 1900, to June 30, 1901.

Publication.	Received.	Distributed.
Publications printed prior to July 1, 1900	----------	350,742
DIVISION OF ACCOUNTS AND DISBURSEMENTS.		
Report of the Chief for 1900	313	288
Fiscal Regulations of the Department of Agriculture	3,000	----------
DIVISION OF AGROSTOLOGY.		
Bulletin No. 2 (revised)	5,000	5,198
Bulletin No. 7 (reprint)	1,000	439
Bulletin No. 17 (revised)	1,000	660
Bulletin No. 20 (revised)	1,000	459
Bulletin No. 23	3,125	1,961
Bulletin No. 24	3,000	1,883
Circular No. 6	5,000	949
Circular No. 25	10,000	13,921
Circular No. 27	2,000	823
Circular No. 28	5,000	4,735
Circular No. 29	2,500	1,662
Circular No. 30	2,500	1,555
Circular No. 31	5,000	1,028
Circular No. 32	2,500	1,628
Circular No. 33	3,000	1,330
Circular No. 34	2,500	1,410
Circular No. 35	2,500	270
Report of the Agrostologist, 1900	1,000	205
BUREAU OF ANIMAL INDUSTRY.		
Bulletin No. 25	3,000	2,959
Bulletin No. 26	3,000	1,025
Bulletin No. 27	17,500	12,601
Bulletin No. 28	1,500	1,212
Circular No. 23	30,000	17,048
Circular No. 31	10,000	15,346
Circular No. 32	2,000	721
Circular No. 33	6,000	3,443
Circular No. 34	2,000	1,090
Report of the Chief, 1900	1,200	292
Sixteenth Annual Report of the Bureau of Animal Industry for the Year 1899	9,000	5,805
Statistics of Oleomargarine, Oleo Oil, etc., from Sixteenth Annual Report, 1899	6,000	6,000
Report upon Experimental Exports of Butter, 1898–1899, from Sixteenth Annual Report, 1899	12,000	10,993
Report upon Examination of Milk, from Sixteenth Annual Report, 1899	2,000	593
Experiments with Texas Fever, etc., from Sixteenth Annual Report, 1899	2,000	311
Foreign Markets for Eggs and Poultry, from Sixteenth Annual Report, 1899	2,000	634
Notes on Parasites, 50–52, from Sixteenth Annual Report, 1899	1,000	1,000
Notes on the Animal Industry of Porto Rico, from Sixteenth Annual Report, 1899	1,000	556
Seventh International Veterinary Congress, from Sixteenth Annual Report, 1899	1,000	1,000
Note on Chicken Tick, from Sixteenth Annual Report, 1899	1,000	1,000
Our Present Knowledge of the Kidney Worm, from Sixteenth Annual Report, 1899	1,000	662
The Nature, Cause, and Economic Importance of Ovine-Caseous Lymph-Adenitis, from Sixteenth Annual Report, 1899	1,000	278
DIVISION OF BIOLOGICAL SURVEY.		
Bulletin No. 12	1,500	1,297
Bulletin No. 13	4,030	4,030
Bulletin No. 14	5,000	3,826

Publications other than Farmers' Bulletins received and distributed from July 1, 1900, to June 30, 1901—Continued.

Publication.	Received.	Distributed.
DIVISION OF BIOLOGICAL SURVEY—continued.		
Circular No. 28	6,000	2,957
Circular No. 29	6,000	6,000
Circular No. 30	2,000	2,000
Circular No. 31	15,000	13,897
Circular No. 32	5,000	952
Circular No. 33	4,000	2,608
North American Fauna No. 16	1,500	1,416
North American Fauna No. 18	3,000	2,548
North American Fauna No. 19	3,000	3,000
Birds of the Yukon Region, etc., from North American Fauna No. 19	150	150
Report of the Acting Chief of Biological Survey, 1900	300	300
DIVISION OF BOTANY.		
Bulletin No. 22	2,000	1,569
Bulletin No. 25	3,000	2,290
Bulletin No. 26	6,000	5,842
Circular No. 18	46,500	48,589
Circular No. 20	3,000	2,323
Circular No. 27	2,000	1,889
Circular No. 28	8,000	3,107
Circular No. 29	5,000	4,284
Circular No. 30	4,000	2,354
U. S. National Herbarium, Vol. V, No. 5	5,000	4,958
U. S. National Herbarium, Vol. VII, No. 1	1,000	972
Report of Botanist for 1900	200	182
Circular No. 1, Section of Seed and Plant Introduction	3,000	3,000
Circular No. 2, Section of Seed and Plant Introduction	2,500	2,026
Inventory No. 7, Section of Seed and Plant Introduction	1,500	1,053
Inventory No. 8, Section of Seed and Plant Introduction	2,000	1,404
DIVISION OF CHEMISTRY.		
Bulletin No. 57	500	217
Bulletin No. 58	3,000	3,000
Bulletin No. 59	2,000	1,239
Bulletin No. 60	3,000	2,677
Bulletin No. 61	4,000	2,851
Bulletin No. 62	1,000	872
Circular No. 3	1,000	1,000
Circular No. 6	5,000	5,000
Circular No. 7	150	150
Progress of Sugar Beet Industry in the United States in 1899, etc	8,000	4,268
Report of the Chemist for 1900	500	207
Rapport sur l'usage et les Possibilités de l'Extension du Maïs (Blé d'Inde) en Europe	5,000	5,000
DIVISION OF ENTOMOLOGY.		
Bulletin No. 25 (old series, reprint)	1,000	295
Bulletin No. 1 (new series, reprint)	1,000	1,000
Bulletin No. 24 (new series)	2,000	1,857
Bulletin No. 25 (new series)	4,500	4,500
Bulletin No. 26 (new series)	2,840	2,703
Observations on Diabrotica, from Bulletin No. 26	100	100
Notes on Coccidæ of Georgia, from Bulletin No. 26	100	100
Insects of the Year in Ohio, from Bulletin No. 26	100	100
Bulletin No. 27 (new series)	1,000	794
Circular No. 5 (second series)	2,500	733
Circular No. 10 (second series)	2,500	822
Circular No. 13 (second series)	3,500	1,220
Circular No. 16 (second series)	1,000	531
Circular No. 21 (second series)	2,500	618
Circular No. 22 (second series)	2,500	2,500
Circular No. 34 (second series)	3,000	1,123
Circular No. 40 (second series)	3,500	1,623
Circular No. 41 (second series)	5,500	1,732
Circular No. 42 (second series)	5,000	2,986
Circular No. 43 (second series)	3,000	1,435
Bibliography of the More Important Contributions to American Economic Entomology, Part VII	1,000	952
Report of the Entomologist for 1900	500	210
Objects of the Association of Economic Entomologists, from Bulletin No. 26	150	150
OFFICE OF EXPERIMENT STATIONS.		
Bulletin No. 21	500	695
Bulletin No. 45 (revised)	500	431
Bulletin No. 69 (revised)	1,000	455
Bulletin No. 76	500	279

Publications other than Farmers' Bulletins received and distributed from July 1, 1900, to June 30, 1901—Continued.

Publication.	Received.	Distributed.
OFFICE OF EXPERIMENT STATIONS—continued.		
Bulletin No. 80 (reprint)	1,130	70
Bulletin No. 81 (reprint)	1,000	1,279
Bulletin No. 82	2,010	1,934
Bulletin No. 83	2,000	1,827
Bulletin No. 84	4,100	2,465
Bulletin No. 85	4,050	2,433
Bulletin No. 86	1,000	1,000
Bulletin No. 86, Part I (reprint)	5,000	1,208
Bulletin No. 86, Part II (reprint)	5,000	1,119
Bulletin No. 86, Part III (reprint)	5,025	1,117
Bulletin No. 87	6,000	5,472
Bulletin No. 88	3,500	2,096
Bulletin No. 89	4,000	3,475
Bulletin No. 90	3,000	2,678
Bulletin No. 91	3,000	2,624
Bulletin No. 92	4,000	3,475
Bulletin No. 93	3,000	3,000
Bulletin No. 94	2,000	1,907
Bulletin No. 95	2,000	1,994
Bulletin No. 96	2,000	1,500
Bulletin No. 97	3,000	2,840
Circular No. 28	3,000	2,087
Circular No. 39	300	300
Circular No. 40	2,000	249
Circular No. 44	2,000	1,042
Circular No. 45	3,000	1,954
Circular No. 46	3,000	1,575
Record, Vol. XI, No. 11	4,800	4,549
Record, Vol. XI, No. 12	4,500	3,533
Record, Vol. XII, No. 1	4,560	4,379
Record, Vol. XII, No. 2	5,000	4,395
Record, Vol. XII, No. 3	5,000	4,252
Record, Vol. XII, No. 4	5,000	4,248
Record, Vol. XII, No. 5	5,230	4,057
Record, Vol. XII, No. 6	5,000	4,669
Record, Vol. XII, No. 7	5,000	4,705
Record, Vol. XII, No. 8	5,000	4,711
Record, Vol. XII, No. 9	5,000	4,600
Record, Vol. XII, No. 10	5,000	4,320
Report of the Director for 1900	3,000	1,866
SECTION OF FOREIGN MARKETS.		
Bulletin No. 9	5,000	4,933
Bulletin No. 20	6,000	5,716
Bulletin No. 21	6,000	5,783
Bulletin No. 23	6,100	5,647
Circular No. 23	34,000	30,856
Report of Chief for 1900	5,000	3,542
DIVISION OF FORESTRY.		
Bulletin No. 22 (reprint)	1,030	637
Bulletin No. 24	20,000	17,999
Bulletin No. 28	6,500	5,269
Bulletin No. 29	10,000	7,920
Bulletin No. 30	10,320	4,471
Circular No. 12	2,000	571
Circular No. 21	2,000	1,176
Circular No. 22	22,000	16,823
Report of Forester for 1900	8,000	4,897
LIBRARY.		
Bulletin No. 32	1,000	373
Bulletin No. 33	1,000	878
Bulletin No. 34	1,000	485
Bulletin No. 35	750	750
Report of Librarian for 1900	200	176
DIVISION OF PUBLICATIONS.		
Bulletin No. 5	1,140	1,046
Monthly List of Publications for June, 1900	50,000	47,687
Monthly List of Publications for July, 1900	55,000	33,332
Monthly List of Publications for August, 1900	55,000	51,212
Monthly List of Publications for September, 1900	55,000	51,272
Monthly List of Publications for October, 1900	49,000	47,687
Monthly List of Publications for November, 1900	55,000	45,135
Monthly List of Publications for December, 1900	55,000	51,045

Publications other than Farmers' Bulletins received and distributed from July 1, 1900, to June 30, 1901—Continued.

Publication.	Received.	Distributed.
DIVISION OF PUBLICATIONS—continued.		
Monthly List of Publications for January, 1901	55,000	48,896
Monthly List of Publications for February, 1901	55,000	48,462
Monthly List of Publications for March, 1901	55,000	51,885
Monthly List of Publications for April, 1901	57,000	50,461
Monthly List of Publications for May, 1901	58,000	50,464
Publications for Sale by Superintendent of Documents, No. 179, seventh edition	34,217	42,858
Publications Available for Free Distribution, No. 247, sixth edition	15,000	29,998
Report of Chief for 1900	2,000	1,153
DIVISION OF POMOLOGY.		
Report of the Acting Pomologist for 1900	200	200
DIVISION OF EXPERIMENTAL GARDENS AND GROUNDS.		
Report on the Gardens and Grounds for 1900	1,000	203
OFFICE OF PUBLIC ROAD INQUIRIES.		
Bulletin No. 8	2,500	1,088
Bulletin No. 9	1,500	671
Bulletin No. 12	1,500	919
Bulletin No. 17	5,000	1,241
Report of the Director for 1900	1,000	984
OFFICE OF THE SECRETARY.		
Preliminary Report of the Secretary, 1900	12,810	8,456
Agricultural Resources and Capabilities of Porto Rico (House Doc. No. 171)	2,000	1,546
Report of the Assistant Secretary for 1900	200	175
Circular No. 8 (revised)	5,000	3,087
Circular No. 9	3,500	2,533
Reprint from Report 49	5,000	5,000
Report 58	1,000	232
Report 59	1,000	101
Report 66	5,500	5,097
Report 64	10,000	7,523
Report 67	10,100	6,834
Report 68	3,000	1,880
Yearbook of the Department for 1900	30,000	16,595
Annual Reports of the Department of Agriculture for 1900	3,050	3,000
DIVISION OF SOILS.		
Bulletin No. 17	2,000	946
Circular No. 7	500	500
Report of the Chief for 1900	8,000	6,610
Soil Survey in the Connecticut Valley, from Report 64	1,500	1,500
Soil Survey in Salt Lake Valley, from Report 64	5,000	5,000
Some Necessary Modifications in Methods of Mechanical Analysis as Applied to Alkali Soil, from Report 64	300	300
Application of the Theory of Solution to the Study of Soils, from Report 64	300	300
Salts as Influencing the Rate of Evaporation of Water from Soils, from Report 64	250	250
DIVISION OF STATISTICS.		
Bulletin No. 18	30,500	17,774
Bulletin No. 19	7,000	5,242
Circular No. 12	8,000	6,179
Circular No. 13	10,000	10,000
Circular No. 14	6,000	4,508
Crop Reporter:		
Vol. II, No. 3	63,000	57,499
Vol. II, No. 4	231,200	231,200
Vol. II, No. 4 (supplement)	7,000	6,304
Vol. II, No. 5	225,000	224,185
Vol. II, No. 6	220,400	208,573
Vol. II, No. 7	91,400	82,721
Vol. II, No. 8	85,000	83,635
Vol. II, No. 9	95,000	84,170
Vol. II, No. 10	92,000	84,178
Vol. II, No. 11	92,000	84,237
Vol. II, No. 12	88,000	88,000
Vol. III, No. 1	95,000	83,626
Vol. III, No. 2	85,000	83,384

Publications other than Farmers' Bulletins received and distributed from July 1, 1900, to June 30, 1901—Continued.

Publication.	Received.	Distributed.
DIVISION OF VEGETABLE PHYSIOLOGY AND PATHOLOGY.		
Bulletin No. 20	10,868	9,085
Bulletin No. 21	5,000	2,240
Bulletin No. 22	2,500	1,793
Bulletin No. 23	2,500	2,500
Bulletin No. 24	3,575	1,417
Bulletin No. 25	2,000	1,782
Bulletin No. 26	2,750	2,377
Bulletin No. 27	4,000	2,676
Report of the Chief for 1900	600	213
EXTRACTS FROM YEARBOOKS.		
Mineral Phosphate as Fertilizers, from Yearbook for 1894	500	525
Hawks and Owls from Standpoint of the Farmer, from Yearbook for 1894	5,000	1,201
Grasses as Sand and Soil Binders, from Yearbook for 1894	2,000	441
The Cause and Prevention of Pear Blight, from Yearbook for 1895	5,000	860
Pruning and Training of Grapes, from Yearbook for 1896	5,000	1,348
Every Farm an Experiment Station, from Yearbook for 1897	1,000	302
Utilizing Surplus Fruits, from Yearbook for 1898	1,000	401
The Present Condition of Grape Culture in California, from Yearbook for 1898	500	141
Steel-Track Wagon Roads, from Yearbook for 1898	1,000	569
Construction of Good Country Roads, from Yearbook for 1898	1,000	702
The Movement and Retention of Water in Soils, from Yearbook for 1898	1,000	336
The Soluble Mineral Matter of Soils, from Yearbook for 1898	1,000	241
Some Examples of the Development of Knowledge Concerning Animal Diseases, from Yearbook for 1899	500	239
Administrative Work of the Federal Government in Relation to the Animal Industry, from Yearbook for 1899	500	194
Dairy Development in the United States, from Yearbook for 1899	8,025	7,090
Development of the Nutrition Investigations of the Department of Agriculture, from Yearbook for 1899	1,000	383
Soil Investigation in the United States, from Yearbook for 1899	2,000	372
Agricultural Education in the United States, from Yearbook for 1899	1,000	344
Progress in Economic Entomology in the United States, from Yearbook for 1899	1,000	353
Progress of Road Building in the United States, from Yearbook for 1899	3,000	1,053
Development of Transportation in the United States, from Yearbook for 1899	100	84
Work of the Breeder in Improving Live Stock, from Yearbook for 1899	100	100
Agricultural Experiment Stations in the United States, from Yearbook for 1899	2,000	217
Progress of Economic and Scientific Agrostology, from Yearbook for 1899	2,000	1,305
A Review of Economic Ornithology in the United States, from Yearbook for 1899	3,000	2,364
Development of Agricultural Libraries, from Yearbook for 1899	500	361
Progress of Agriculture in the United States, from Yearbook for 1899	3,000	2,766
The Relation of Chemistry to the Progress of Agriculture, from Yearbook for 1899	3,000	528
Rise and Future of Irrigation in the United States, from Yearbook for 1899	1,000	959
Progress of Plant Breeding in the United States, from Yearbook for 1899	3,000	1,460
Work of the Meteorologist for the Benefit of Agriculture, Commerce, and Navigation, from Yearbook for 1899	2,000	2,000
Seed Selling, Seed Growing, and Seed Testing, from Yearbook for 1899	2,000	628
A Directory for Farmers, from Yearbook for 1899	3,800	2,441
Progress of Forestry in the United States, from Yearbook for 1899	15,000	4,220
The Practice of Forestry by Private Owners, from Yearbook for 1899	15,000	5,312
Growth of the Tobacco Industry, from Yearbook for 1899	5,000	131
Progress in the Treatment of Plant Diseases in the United States, from Yearbook for 1899	3,000	2,070
Succulent Forage for Farm and Dairy, from Yearbook for 1899	3,000	1,535
Progress of Commercial Growing of Plants Under Glass, from Yearbook for 1899	6,000	5,106
Rabies: Its Cause, Frequency, and Treatment, from Yearbook for 1900	2,000	1,520
Agricultural Education in France, from Yearbook for 1900	1,000	25
A Directory for Farmers, from Yearbook for 1900	2,000	1
Total	3,117,368	3,038,918

Farmers' Bulletins printed, and Congressional and miscellaneous distribution, for the fiscal year 1900–1901.

No. of bulletin.	Title of bulletin.	Total number received.	Distributed to Congressmen.	Miscellaneous distribution.
16	Leguminous Plants for Green Manuring and for Feeding	35,000	17,683	6,700
17	Peach Yellows and Peach Rosette	20,000		
19	Important Insecticides: Directions for Their Preparation and Use		4,600	1,647
20	Washed Soils: How to Prevent and Reclaim Them		13,490	6,180
21	Barnyard Manure		1,090	1,460
22	Feeding Farm Animals	50,200	25,755	7,819
23	Foods: Nutritive Value and Cost	40,800	35,014	8,000
24	Hog Cholera and Swine Plague	30,000	23,779	11,162
25	Peanuts: Culture and Uses	45,300	38,744	6,887
26	Sweet Potatoes: Culture and Uses		10,199	5,399
27	Flax for Seed and Fiber	30,200	19,154	5,943
28	Weeds, and How to Kill Them	20,000	5,566	2,571
29	Souring of Milk, and Other Changes in Milk Products	30,000	29,047	10,405
30	Grape Diseases on the Pacific Coast	30,000	16,301	7,099
31	Alfalfa, or Lucern	10,000	3,610	2,468
32	Silos and Silage	20,000	18,368	7,534
33	Peach Growing for Market	20,000	15,206	6,334
34	Meats: Composition and Cooking	30,000	21,158	6,785
35	Potato Culture	15,000	18,983	8,087
36	Cotton Seed and its Products	55,000	34,416	9,429
37	Kafir Corn: Characteristics, Culture, and Uses	30,000	12,853	3,452
38	Spraying for Fruit Diseases	20,000	13,269	6,136
39	Onion Culture	20,000	26,831	9,083
40	Farm Drainage	47,000	15,519	5,618
41	Fowls: Care and Feeding	45,000	27,296	6,233
42	Facts About Milk	75,900	56,887	14,844
43	Sewage Disposal on the Farm	55,000	28,195	7,818
44	Commercial Fertilizers		7,577	4,242
45	Some Insects Injurious to Stored Grain	20,500	19,097	6,827
46	Irrigation in Humid Climates	10,000	18,590	4,342
47	Insects Affecting the Cotton Plant	20,000	4,402	3,091
48	The Manuring of Cotton	10,000	14,996	2,944
49	Sheep Feeding	35,000	15,978	2,588
50	Sorghum as a Forage Crop	20,000	26,440	6,303
51	Standard Varieties of Chickens	45,000	18,423	4,909
52	The Sugar Beet	45,000	49,209	15,531
53	How to Grow Mushrooms	46,800	17,869	4,232
54	Some Common Birds in Their Relation to Agriculture		12,187	8,509
55	The Dairy Herd: Its Formation and Management	20,000	26,532	8,695
56	Experiment Station Work—I	45,000	33,320	9,323
57	Butter Making on the Farm	15,000	13,171	5,009
58	The Soy Bean as a Forage Crop	55,000	30,833	7,897
59	Bee Keeping	10,000	10,172	4,992
60	Methods of Curing Tobacco	15,000	23,150	10,162
61	Asparagus Culture		12,044	3,463
62	Marketing Farm Produce	40,200	16,317	8,573
63	Care of Milk on the Farm	30,600	22,154	6,617
64	Ducks and Geese	45,000	28,884	7,250
65	Experiment Station Work—II	25,760	31,454	8,477
66	Meadows and Pastures	15,000	13,300	4,569
67	Forestry for Farmers	30,000	22,428	5,710
68	The Black Rot of the Cabbage	30,000	15,741	5,636
69	Experiment Station Work—III		13,018	4,272
70	The Principal Insect Enemies of the Grape	30,000	10,926	4,481
71	Some Essentials in Beef Production	15,100	11,321	4,627
72	Cattle Ranges of the Southwest	45,000	23,035	5,639
73	Experiment Station Work—IV		6,821	3,465
74	Milk as Food	10,200	12,296	4,443
75	The Grain Smuts	30,120	19,831	7,687
76	Tomato Growing	30,000	15,583	4,707
77	The Liming of Soils	45,000	24,928	9,210
78	Experiment Station Work—V	15,200	13,974	5,559
79	Experiment Station Work—VI	15,000	9,385	4,410
80	The Peach Twig-borer—an Important Enemy of Stone Fruits	15,000	8,175	3,840
81	Corn Culture in the South	35,000	14,820	4,894
82	The Culture of Tobacco	30,000	20,815	4,813
83	Tobacco Soils		14,514	3,937
84	Experiment Station Work—VII		17,692	2,942
85	Fish as Food	15,000	10,138	4,952
86	Thirty Poisonous Plants	30,000	13,137	7,089
87	Experiment Station Work—VIII	30,000	18,137	7,842
88	Alkali Lands	10,000	9,336	4,477
89	Cowpeas		4,926	2,478
90	The Manufacture of Sorghum Sirup	30,000	21,234	6,758
91	Potato Diseases and Their Treatment	25,000	18,661	4,264
92	Experiment Station Work—IX	41,180	35,042	8,863
		15,300	13,039	4,483

Farmers' Bulletins printed, and Congressional and miscellaneous distribution, for the fiscal year 1900–1901—Continued.

No. of bulletin.	Title of bulletin.	Total number received.	Distributed to Congressmen.	Miscellaneous distribution.
93	Sugar as Food	----------	10,803	6,553
94	The Vegetable Garden	60,000	48,705	11,627
95	Good Roads for Farmers	100,660	81,141	7,877
96	Raising Sheep for Mutton	30,471	33,710	7,855
97	Experiment Station Work—X	----------	10,613	4,440
98	Suggestions to Southern Farmers	----------	19,182	3,806
99	Three Insect Enemies of Shade Trees	35,000	18,430	4,433
100	Hog Raising in the South	15,360	28,557	4,466
101	Millets	15,000	13,725	4,266
102	Southern Forage Plants	25,000	15,698	3,916
103	Experiment Station Work—XI	15,300	12,018	4,635
104	Notes on Frost	45,000	14,828	6,501
105	Experiment Station Work—XII	15,000	9,824	5,286
106	Breeds of Dairy Cattle	110,000	61,920	11,601
107	Experiment Station Work—XIII	15,000	15,229	6,846
108	Saltbushes	----------	4,569	2,711
109	Farmers' Reading Courses	80,200	34,140	17,718
110	Rice Culture in the United States	10,000	5,322	2,940
111	The Farmer's Interest in Good Seed	35,300	29,456	6,009
112	Bread and Bread Making	50,280	30,556	10,290
113	The Apple and How to Grow It	90,600	62,971	13,214
114	Experiment Station Work—XIV	20,100	14,630	6,368
115	Hop Culture in California	----------	2,281	7,662
116	Irrigation in Fruit Growing	30,200	13,361	10,777
117	Sheep, Hogs, and Horses in the Northwest	60,000	30,524	11,143
118	Grape Growing in the South	60,000	22,242	9,966
119	Experiment Station Work—XV	50,000	18,514	16,987
120	The Principal Insects Affecting the Tobacco Plant	30,150	7,435	7,624
121	Beans, Peas, and other Legumes as Food	90,000	34,036	16,943
122	Experiment Station Work—XVI	60,000	12,490	10,104
123	Red Clover Seed	30,000	13,372	9,230
124	Experiment Station Work—XVII	30,000	8,017	10,670
125	Protection of Food Products from Injurious Temperatures	20,800	4,545	12,739
126	Practical Suggestions for Farm Buildings	50,000	19,138	17,770
127	Important Insecticides	30,000	3,931	15,334
128	Eggs and Their Uses as Food	30,000	3,657	10,971
129	Sweet Potatoes	30,000	4,116	8,018
130	The Mexican Cotton Boll Weevil	30,000	251	9,683
131	Household Tests for Detection of Oleomargarine and Renovated Butter	30,000	136	5,020
132	The Principal Insect Enemies of Growing Wheat	15,100	2,872	12,228
	Total	3,359,881	2,195,010	821,343

Publications received and distributed by the Weather Bureau during the year ended June 30, 1901, by quarters.

Number and title of publication.	Number of copies.
QUARTER ENDED SEPTEMBER 30, 1900.	
Received.	
No. 221. Bulletin G. Atmospheric Radiation: A Research Conducted at the Allegheny Observatory and at Providence, R. I.	2,000
No. 224. Monthly Weather Review for May, 1900	4,450
No. 225. Monthly Weather Review for June, 1900	4,450
No. 226. Monthly Weather Review for July, 1900	4,450
Report of the Chief of the Weather Bureau, 1898–99, Part II	50
Report of the Chief of the Weather Bureau, 1898–99, Part III	500
Report of the Chief of the Weather Bureau, 1898–99, Part IV	100
Report of the Chief of the Weather Bureau, 1898–99, Part V	100
Work of the Meteorologist for the Benefit of Agriculture, Commerce, and Navigation	2,000
Bound Washington Daily Weather Maps, July 1, 1897, to December 31, 1897	10
Washington Daily Weather Maps	129,960
Meteorological Chart of the Great Lakes	9,098
Climate and Crop Bulletin	53,173
Storm Bulletin No. 1, 1900. West Indian Hurricane of September 1–10, 1900	425
Distributed.	
Report of the Chief of the Weather Bureau, 1891–92	1
Report of the Chief of the Weather Bureau, 1893	2
Report of the Chief of the Weather Bureau, 1894	3
Report of the Chief of the Weather Bureau, 1895–96	7
Report of the Chief of the Weather Bureau, 1896–97	12
Report of the Chief of the Weather Bureau, 1897–98	13

Publications received and distributed by the Weather Bureau during the year ended June 30, 1901, by quarters—Continued.

Number and title of publication.	Number of copies.
QUARTER ENDED SEPTEMBER 30, 1900—continued.	
Distributed—Continued.	
Report of the Chief of the Weather Bureau, 1898-99, Vol. I	35
Separates from the Report of the Chief of the Weather Bureau, 1891-92	84
Separates from the Report of the Chief of the Weather Bureau, 1894	13
Separates from the Report of the Chief of the Weather Bureau for 1895-96	4
Separates from the Report of the Chief of the Weather Bureau for 1896-97	18
Separates from the Report of the Chief of the Weather Bureau, 1897-98	42
Separates from the Report of the Chief of the Weather Bureau, 1898-99	139
Description of Cloud Forms	270
Bulletin No. 25	15
Bulletin No. 26	27
Bulletin No. 28	5
Bulletin C	7
Bulletin D	32
Bulletin E	2
No. 199. Property Loss by Lightning	24
No. 221. Bulletin G. Atmospheric Radiation: A Research Conducted at the Allegheny Observatory and at Providence, R. I.	750
No. 219. Frost Fighting	250
No. 224. Monthly Weather Review for May, 1900	4,400
No. 225. Monthly Weather Review for June, 1900	4,400
No. 226. Monthly Weather Review for July, 1900	4,000
Work of the Meteorologist for the Benefit of Agriculture, Commerce, and Navigation	1,500
Bound Washington Daily Weather Maps, July 1, 1897, to December 31, 1897	10
Washington Daily Weather Maps	129,960
Meteorological Chart of the Great Lakes	9,098
Climate and Crop Bulletin	53,173
Storm Bulletin No. 1, 1900. West Indian Hurricane of September 1-10, 1900	425
QUARTER ENDED DECEMBER 31, 1900.	
Received.	
No. 227. Daily River Stages at River Gauge Stations on the Principal Rivers of the United States, Part VI, for the years 1896, 1897, 1898, and 1899	400
No. 228. Tables of Daily Precipitation for the years 1893, 1894, 1895	800
No. 229. Monthly Weather Review for August, 1900	4,450
No. 230. Monthly Weather Review for September, 1900	4,450
No. 231. Report of the Chief of the Weather Bureau for 1900	1,000
No. 232. Bulletin H. West Indian Hurricanes	2,000
No. 233. Circular D, Instrument Division. Anemometry. Second edition	1,500
No. 234. Monthly Weather Review for October, 1900	4,450
Washington Daily Weather Maps	137,742
Meteorological Charts of the Great Lakes	6,104
Climate and Crop Bulletin	13,258
Bound Monthly Weather Reviews for the year 1899	200
Snow and Ice Bulletin	6,600
Report of the Chief of the Weather Bureau for 1898-99, Vol. II	1,000
Distributed.	
Report of the Chief of the Weather Bureau, 1891-92	6
Report of the Chief of the Weather Bureau, 1893	4
Report of the Chief of the Weather Bureau, 1894	4
Report of the Chief of the Weather Bureau, 1895-96	7
Report of the Chief of the Weather Bureau, 1896-97	5
Report of the Chief of the Weather Bureau, 1897-98	4
Report of the Chief of the Weather Bureau, 1898-99, Vol. I	134
Report of the Chief of the Weather Bureau, 1898-99, Vol. 2	840
Separates from Report of the Chief of the Weather Bureau, 1891-92	30
Separates from the Report of the Chief of the Weather Bureau, 1894	11
Separates from Report of the Chief of the Weather Bureau for 1895-96	13
Separates from Report of the Chief of the Weather Bureau for 1896-97	23
Separates from Report of the Chief of the Weather Bureau for 1897-98	26
Separates from Report of the Chief of the Weather Bureau for 1898-99	45
Description of Cloud Forms	304
Bulletin A	1
Bulletin C	3
Bulletin D	15
Bulletin E	4
Bulletin No. 22	7
Bulletin No. 23	8
Bulletin No. 25	22
Bulletin No. 26	22
Bulletin No. 28	12
Bulletin No. 29	12
No. 199. Property Loss by Lightning	15
No. 208. Bulletin F. Report on Kite Observations, 1898	7

Publications received and distributed by the Weather Bureau during the year ended June 30, 1901, by quarters—Continued.

Number and title of publication.	Number of copies.
QUARTER ENDED DECEMBER 31, 1900—continued.	
Distributed—Continued.	
No. 221. Bulletin G. Atmospheric Radiation: A Research Conducted at the Allegheny Observatory and at Providence, R. I.	610
No. 227. Daily River Stages at River Gauge Stations on the Principal Rivers of the United States, Part VI, 1896, 1897, 1898, and 1899	360
No. 228. Tables of Daily Precipitation for the years 1893, 1894, and 1895	728
No. 229. Monthly Weather Review for August, 1900	4,400
No. 230. Monthly Weather Review for September, 1900	4,400
No. 231. Report of the Chief of the Weather Bureau for 1900	700
No. 232. Bulletin H. West Indian Hurricanes	1,300
No. 233. Circular D. Instrument Division. Anemometry. Second edition	1,500
No. 234. Monthly Weather Review for October, 1900	4,400
Washington Daily Weather Maps	137,742
Meteorological Charts of the Great Lakes	6,104
Climate and Crop Bulletin	13,258
Snow and Ice Bulletin	6,600
Bound Monthly Weather Reviews for 1899	200
QUARTER ENDED MARCH 31, 1901.	
Received.	
No. 235. Psychrometric Tables for Obtaining the Vapor Pressures, Relative Humidity, and Temperature of the Dew-Point	5,000
No. 236. Monthly Weather Review for November, 1900	4,450
No. 237. Meteorological Chart of the Great Lakes. Summary for the Season of 1900. Volume III, No. 10	2,500
No. 238. Monthly Weather Review for December, 1900	4,450
No. 239. Monthly Weather Review. Annual Summary for 1900	4,500
No. 240. Monthly Weather Review for January, 1901	4,500
Washington Daily Weather Maps	138,046
Climate and Crop Bulletin	14,463
Snow and Ice Bulletin	22,404
Washington Daily Weather Maps bound from January 1, 1898, to June 30, 1898	11
Distributed.	
Report of the Chief of the Weather Bureau, 1891-92	5
Report of the Chief of the Weather Bureau, 1893	6
Report of the Chief of the Weather Bureau, 1894	5
Report of the Chief of the Weather Bureau, 1895-96	6
Report of the Chief of the Weather Bureau, 1896-97	5
Report of the Chief of the Weather Bureau, 1897-98	3
Report of the Chief of the Weather Bureau, 1898-99, Vol. I	8
Report of the Chief of the Weather Bureau, 1898-99, Vol. II	22
Separates from the Report of the Chief of the Weather Bureau, 1891-92	72
Separates from the Report of the Chief of the Weather Bureau for 1893	5
Separates from the Report of the Chief of the Weather Bureau for 1894	9
Separates from the Report of the Chief of the Weather Bureau for 1895-96	36
Separates from the Report of the Chief of the Weather Bureau for 1896-97	46
Separates from the Report of the Chief of the Weather Bureau for 1897-98	72
Separates from the Report of the Chief of the Weather Bureau for 1898-99	21
Description of Cloud Forms. Fourth edition	131
Certain Climatic Features of the Two Dakotas	105
Bulletin A	1
Bulletin C	7
Bulletin D	35
Bulletin E	5
Bulletin F	763
Bulletin G	34
Bulletin H	84
Bulletin No. 11, Part III	5
Bulletin No. 14	6
Bulletin No. 16	7
Bulletin No. 19	8
Bulletin No. 22	9
Bulletin No. 23	11
Bulletin No. 25	45
Bulletin No. 26	40
Bulletin No. 28	8
No. 199. Property Loss by Lightning	9
No. 227. Daily River Stages at River Gauge Stations on the Principal Rivers of the United States, Parts V and VI (four of each part)	8
No. 235. Psychrometric Tables for Obtaining the Vapor Pressures, Relative Humidity, and Temperature of the Dew-Point	5,000
No. 236. Monthly Weather Review for November, 1900	4,400
No. 237. Meteorological Chart of the Great Lakes. Summary for 1900, Vol. III, No. 10	2,500
No. 238. Monthly Weather Review for December, 1900	4,400
No. 239. Monthly Weather Review. Annual Summary for 1900	4,450
No. 240. Monthly Weather Review for January, 1900	4,450
Washington Daily Weather Maps	138,046

Publications received and distributed by the Weather Bureau during the year ended June 30, 1901, by quarters—Continued.

Number and title of publication.	Number of copies.
QUARTER ENDED MARCH 31, 1901—continued.	
Distributed—Continued.	
Climate and Crop Bulletins	14,463
Snow and Ice Chart	22,404
Washington Daily Weather Maps (bound), from January 1, 1898, to June 30, 1898	11
QUARTER ENDED JUNE 30, 1901.	
Received.	
No. 241. Circular F, Instrument Division. Second edition. Barometers and the Measurement of Atmospheric Pressure	1,500
No. 242. Monthly Weather Review for February, 1901	4,500
No. 243. Monthly Weather Review for March, 1901	4,500
No. 244. Meteorological Chart of the Great Lakes, No. 1, 1901	3,000
No. 245. Monthly Weather Review for April, 1901	4,500
Report of the Chief of the Weather Bureau, 1899–1900	1,000
Report of the Chief of the Weather Bureau, 1899–1900, Part II, List of Observing Stations and Changes Therein during 1899	50
Report of the Chief of the Weather Bureau, 1899–1900, Part III, Monthly and Annual Meteorological Summaries	500
Report of the Chief of the Weather Bureau, 1899–1900, Part IV, Monthly and Annual Mean Temperature and Annual Extremes of Temperatures, together with the dates of first and last killing frost, 1899	200
Report of the Chief of the Weather Bureau, 1899–1900, Part V, Monthly and Annual Precipitation, 1899. All stations	200
Report of the Chief of the Weather Bureau, 1899–1900, Part VI, Miscellaneous Meteorological Tables and Reports	250
Report of the Chief of the Weather Bureau, 1899–1900, Part VII, Meteorological Observations of the Second Wellman Expedition	500
Washington Daily Weather Maps (bound), from July 1, 1898, to December 31, 1898, inclusive	11
Washington Daily Weather Maps (bound), January 1, 1899, to June 30, 1899, inclusive	11
Washington Daily Weather Maps	142,050
Climate and Crop Bulletin	55,476
Distributed.	
Report of the Chief of the Weather Bureau, 1891–92	6
Report of the Chief of the Weather Bureau, 1893	7
Report of the Chief of the Weather Bureau, 1894	10
Report of the Chief of the Weather Bureau, 1895–96	7
Report of the Chief of the Weather Bureau, 1896–97	6
Report of the Chief of the Weather Bureau, 1897–98	6
Report of the Chief of the Weather Bureau, 1898–99, Vol. I	7
Report of the Chief of the Weather Bureau, 1898–99, Vol. II	10
Report of the Chief of the Weather Bureau, 1899–1900	985
Separates from the Report of the Chief of the Weather Bureau, 1891–92	31
Separates from the Report of the Chief of the Weather Bureau, 1894	5
Separates from the Report of the Chief of the Weather Bureau, 1895–96	7
Separates from the Report of the Chief of the Weather Bureau, 1896–97	15
Separates from the Report of the Chief of the Weather Bureau, 1897–98	31
Separates from the Report of the Chief of the Weather Bureau, 1898–99	6
Separates from the Report of the Chief of the Weather Bureau for 1899–1900	679
Bulletin No. 11, Part III	4
Bulletin No. 14	5
Bulletin No. 16	6
Bulletin No. 19	3
Bulletin No. 22	4
Bulletin No. 23	5
Bulletin No. 25	14
Bulletin No. 26	25
Bulletin No. 28	5
Bulletin D	17
Bulletin E	3
Bulletin F	6
Bulletin G	5
Bulletin H	29
No. 199. Property Loss by Lightning	11
No. 241. Circular F, Instrument Division. Second edition. Barometers and the Measurement of Atmospheric Pressure	1,500
No. 242. Monthly Weather Review for February, 1901	4,450
No. 243. Monthly Weather Review for March, 1901	4,450
No. 244. Meteorological Chart of the Great Lakes, No. 1, 1901	3,000
No. 245. Monthly Weather Review for April, 1901	4,450
Washington Daily Weather Maps (bound), from July 1, 1898, to December 31, 1898, inclusive	11
Washington Daily Weather Maps (bound), from January 1, 1899, to June 30, 1899, inclusive	11
Washington Daily Weather Maps	142,050
Climate and Crop Bulletin	55,476
Description of Cloud Forms	43

DAILY WEATHER MAPS, METEOROLOGICAL CHARTS, SNOW AND ICE BULLETINS, AND CLIMATE AND CROP BULLETINS ISSUED BY WEATHER BUREAU.

The following shows the number of copies of Washington Daily Weather Maps, Meteorological Charts of the Great Lakes, Snow and Ice Bulletins, and Climate and Crop Bulletins of the Weather Bureau issued each month from July 1, 1900, to June 30, 1901:

Daily Weather Maps, Meteorological Charts, Snow and Ice Bulletins, and Climate and Crop Bulletins issued by Weather Bureau.

Maps, charts, and bulletins.	Number of copies.
WASHINGTON DAILY WEATHER MAPS.	
Washington Daily Weather Maps, July, 1900	36,600
Washington Daily Weather Maps, August, 1900	46,520
Washington Daily Weather Maps, September, 1900	43,840
Washington Daily Weather Maps, October, 1900	47,556
Washington Daily Weather Maps, November, 1900	44,418
Washington Daily Weather Maps, December, 1900	45,768
Washington Daily Weather Maps, January, 1901	46,888
Washington Daily Weather Maps, February, 1901	43,920
Washington Daily Weather Maps, March, 1901	47,238
Washington Daily Weather Maps, April, 1901	48,030
Washington Daily Weather Maps, May, 1901	48,080
Washington Daily Weather Maps, June, 1901	45,940
Total	544,798
METEOROLOGICAL CHARTS OF THE GREAT LAKES.	
Meteorological Charts of the Great Lakes, July, 1900	3,029
Meteorological Charts of the Great Lakes, August, 1900	3,039
Meteorological Charts of the Great Lakes, September, 1900	3,034
Meteorological Charts of the Great Lakes, October, 1900	3,025
Meteorological Charts of the Great Lakes, November, 1900	3,075
Meteorological Charts of the Great Lakes, December, 1900	3,029
Meteorological Charts of the Great Lakes, No. 1, 1901, W. B. No. 244	3,000
Total	21,231
SNOW AND ICE BULLETINS.	
Snow and Ice Bulletins, December, 1900	6,600
Snow and Ice Bulletins, January, 1901	8,824
Snow and Ice Bulletins, February, 1901	7,200
Snow and Ice Bulletins, March, 1901	7,380
Total	30,004
CLIMATE AND CROP BULLETINS.	
Climate and Crop Bulletins, July, 1900	20,795
Climate and Crop Bulletins, August, 1900	16,729
Climate and Crop Bulletins, September, 1900	16,649
Climate and Crop Bulletins, October, 1900	4,163
Climate and Crop Bulletins, November, 1900	4,500
Climate and Crop Bulletins, December, 1900	4,595
Climate and Crop Bulletins, January, 1901	5,135
Climate and Crop Bulletins, February, 1901	4,656
Climate and Crop Bulletins, March, 1901	4,672
Climate and Crop Bulletins, April, 1901	21,330
Climate and Crop Bulletins, May, 1901	17,586
Climate and Crop Bulletins, June, 1901	16,560
Total	137,370

REPORT OF THE FORESTER.

U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF FORESTRY,
Washington, D. C., October 10, 1901.

SIR: I have the honor to transmit herewith a report of the work of the Division of Forestry for the fiscal year ended June 30, 1901, together with an outline of the plans for the work of the new Bureau for the current fiscal year.

Respectfully,

GIFFORD PINCHOT,
Forester.

Hon. JAMES WILSON, *Secretary.*

WORK OF THE YEAR.

GENERAL PROGRESS.

During the past year the demand for the services of the Division of Forestry has continued steadily to outstrip its resources. In particular, the demand for forest working plans has notably increased, although the gain in acres is less than for the previous year, since the latter included the whole area of the National forest reserves, and no other single application of parallel magnitude is possible.

Beyond the increased demand for the services of the Division, and the increased appreciation of its work in which this demand had its rise, the most notable fact of the year was the advancement of the Division to be a Bureau by the agricultural appropriation bill approved March 2, 1901. The Bureau of Forestry came into existence July 1, 1901.

The Bureau is now called upon to give practical assistance and advice in the management of National, State, and private forests on about 50,000,000 acres, an area larger than that covered by the State of Nebraska. It has become to the people of the United States the recognized source of help in the handling of timber tracts and wood lots, the making of forest plantations, the study of commercial trees, and the investigation of important forest problems. It is occupying more and more fully its natural position as adviser in all forest matters in this country.

During the past year the preparation of the results for publication has been somewhat overshadowed by the urgent demand for field work, to satisfy which must always be the first duty of the Bureau. Provision has, however, been made for the prompt preparation of reports for publication in future, and the large number of manuscripts on hand will be made ready as rapidly as possible.

Satisfactory progress has been made during the year in the further organization of a body of trained men, which was wholly lacking

until recently. The expansion of this force, which has been a matter of great difficulty in the past, will be comparatively easy in the future, since the Bureau may now look for a steady supply of trained men from the forest schools.

The steady growth of public interest in the preservation and wise use of forests during the past year is a subject for congratulation. Not only has the interest in forest management spread among important lumber companies and other holders of forest lands, but the interest in forest preservation has taken firmer hold than ever before of those portions of the country whose prosperity depends upon their water supply. The intimate relation of forests and waters is being realized in the West with a practical force that is altogether new, and it may fairly be expected that from this time on one of the most powerful aids toward forest preservation will be the cooperation of the irrigation farmer.

There has been a marked development of the forest movement in the South during the past year. The growing appreciation of the advantages of practical forestry is here, no less than in the North, largely the direct result of practical assistance from this Division to private owners in handling their forest lands.

Interest in tree planting has revived in the central West to a very marked degree, as a result of the efforts of this Division, and the promise of still wider and happier results is exceptionally bright.

EFFICIENCY AND GROWTH.

It is believed that the practical efficiency of the Division has never been at a higher point than during the past fiscal year, and it may fairly be hoped that with larger resources and more numerous trained men, and with a further development of the *esprit de corps* which was already a marked characteristic of the Division, the Bureau of Forestry will reach that still higher plane whose attainment is a necessary condition to the fulfillment of the possibilities which lie in the immediate future of Government forest work.

The larger work of the Division so far outgrew its old rooms, together with all the additional space it had been able to secure from kindred organizations in the Department of Agriculture, that it was forced to find larger quarters. On May 1 it took possession of the seventh floor of the Atlantic Building, 930 F street, NW. Tentative arrangements have been made for necessary expansion to other floors of the Atlantic Building, since the present quarters are already becoming too small.

It is a gratifying fact that for the calendar year 1900 the average sick leave taken by employees of the Division of Forestry was but 7.4 per cent and of annual leave but 65.9 per cent of the legal allowance.

SECTION OF WORKING PLANS.

PRIVATE LANDS.

The applications from private owners for assistance in handling their forest lands number 38 for the past year. Twenty-one are for timber tracts and 17 for wood lots, the total area covered being 288,555 acres. The total area of private lands to July 1, 1901, for the management of which assistance has been requested since the publication of Circular No. 21, in October, 1898, is 2,804,648 acres. This circular outlines the terms on which farmers, lumbermen, and others

may cooperate with the Bureau in handling their forest lands. Cooperation on these terms was undertaken in order to create practical examples of the conservative management of private forest lands, to show its advantages over ordinary methods, both to the owner and to the forest, and then by publication to spread a knowledge of the work and its results as widely as possible. Areas of 200 acres and under are examined, and methods of handling are advised, entirely without cost to the owner. In the preparation of detailed working plans for larger tracts, the owners were required to pay the traveling and field expenses of the men engaged in the work, amounting to about one-half the cost of the necessary studies on the ground.

Personal examinations were made during the year of 14 timber tracts and 3 wood lots in 11 States, covering 788,890 acres. Five detailed working plans were made. One of these was for 100,000 acres of Shortleaf and Loblolly Pine in Grant, Jefferson, and Saline counties, Ark., the property of the Sawyer and Austin Lumber Company.

The field work necessary to this working plan occupied a party of 6 men for six months. It included the measurement of the stand upon 1,900 acres and of the rate of growth of 625 trees, with a careful study of the forest, the habits of its trees, and the conditions necessary to their successful reproduction. An investigation was made of the effects of fire on the forest and the best means of preventing its recurrence in the future. The effect of present methods of lumbering was studied in order to advise those modifications which, without encroaching too far upon present profits, will hasten the production of a second crop upon the lumbered area. In brief, the field work included a thorough expert examination of the forest and its possibilities to serve as a basis for the best business policy in its management.

The tract of the Sawyer and Austin Lumber Company is generally favorable for practical forestry. It contains an excellent stand of merchantable timber, for which there is a steady market. The logging and transport of timber are not expensive. The reproduction of the pines, and particularly of the Loblolly, can be assured cheaply under effective protection against fire.

Another detailed working plan was made for a tract of 52,000 acres, in Dunklin and Pemiscot counties, Mo., owned by the Deering Harvester Company. This forest, situated in the moist and fertile valley of the Mississippi, contains valuable hardwoods, particularly oak, ash, and hickory, in mixture with trees of little or no commercial importance. In addition to the good opportunity which it offers for conservative forest management on a sound financial basis, this tract presents at least one exceedingly interesting and important silvicultural problem, namely, to foster, by cutting, the reproduction of the valuable hardwoods against that of the trees of little commercial value with which they occur in mixture.

A third large tract for which a working plan was made during the fiscal year was one of 1,600 acres near Lenox, Mass., the property of Hon. William C. Whitney. It is a second-growth hardwood forest from 15 to 40 years old, from which the first growth has been entirely removed. The problem here was to improve the quality of the future mature stand by the removal of worthless kinds and of stunted, unpromising, and malformed trees. It has been found that these cuttings pay, and they will consequently be continued throughout this forest.

A fourth working plan was completed for 60,000 acres of spruce,

pine, and hardwood in the northern Adirondacks, the property of Mr. William G. Rockefeller. The area is notable as containing one of the most valuable bodies of White Pine in New York.

In addition to those completed, the preparation of working plans was begun upon five timber tracts with a total area of 628,000 acres. One of these, 80,000 acres in extent, lies in the Great Smoky Mountains of eastern Tennessee, a region which offers a wide field for practical forestry and in which the Bureau is doing its first work on a large scale in that State. The field work done on this tract included a careful study of the more important hardwoods, particularly of the White Oak and Yellow Poplar.

A tract of 350,000 acres in Maine, owned by the Great Northern Paper Company, is the largest area of private ownership for which the Division has definitely undertaken a working plan and in several ways one of the most promising. The larger portion of the tract is on the Penobscot River near Moosehead and Chesuncook lakes. The country contains a network of lakes and ponds surrounded by low hills, between which are long stretches of fairly level land. It is in consequence admirably adapted to the cheap logging and transport of soft-wood timber. The forest is composed chiefly of spruce and fir, with a varying mixture of hardwoods. The object of the owners is so to lumber the tract as to insure a sustained supply of soft-wood timber for their mill.

It is a noteworthy fact that, before applying for a working plan for its land, the Great Northern Paper Company had already shown its appreciation of the advantages of conservative forest management by incorporating in its logging contracts several of the more important rules which govern lumbering now carried on under the supervision of the Bureau of Forestry in the Adirondacks. It is believed that the voluntary adoption of these rules by a paper company is the strongest argument in their favor yet made.

In the Adirondacks there are now four tracts to which practical forestry is applied under the direction of the Bureau. One tract of 10,000 acres was added during the year, and the total area under management in that region is now 156,470 acres. An important experiment in thinning second-growth hardwoods has been undertaken on the 14,000 acres of hardwood land in Massachusetts to which reference has been made, in order to test the opportunity to make a profit and improve the stand. The results, coupled with the study of the rate of growth of New England hardwoods now in progress, will be of direct value in suggesting lines along which similar New England woodlands may be advantageously handled.

The first year's work in practical forestry on the 6,000-acre domain of the University of the South, at Sewanee, Tenn., has been satisfactory. The cutting advised in the working plan was carried out under the direction of an agent of the Division. It left the forest in good condition and yielded a profit at least equal to that usually earned by ordinary lumbering under similar conditions in that neighborhood.

This Bureau is now acting as the referee between the State of New York and the Moose River Lumber Company, the holder of a contract to lumber township 8, Herkimer County, N. Y., which now forms a part of the Adirondack Preserve. At the joint request of the Forest, Fish, and Game Commission of New York and the president of the company, the Division of Forestry agreed to mark the timber to be cut under this contract, and to assist in the location of lumber roads, the expense of the work to be borne by the company. This request for

what is practically a combination of arbitration and forest management is a gratifying mark of the influence of the practical field work of the Division of Forestry in the Adirondacks.

The total area of private forests actually under the management of the Bureau of Forestry is now 176,975 acres.

Of the tracts of which preliminary examination was made during the year and for which detailed working plans will be made as soon as possible, one of the most promising is that of the Okeetee Club, near Ridgeland, S. C. This consists of 60,000 acres of Longleaf Pine land in Beaufort and Hampton counties, about 30 miles north of Savannah. It presents a notable opportunity for the study of the Longleaf Pine and of the relation which fire bears to its reproduction. The fact that it is at the same time thoroughly well adapted for practical forestry makes the preparation of the working plan one of the important pieces of work to be undertaken by the Bureau.

The tract of the Moose River Lumber Company, in the Adirondacks, has been examined and a working plan recommended. That this working plan is now in preparation is significant of the growing appreciation by lumbermen and business men generally of the advantages of conservative forestry.

PUBLIC LANDS.

During the past year the Division, as rapidly as its force and its appropriation would allow, has pushed the preparation of working plans for the National forest reserves. This exceedingly important piece of work is the result of a request upon the Secretary of Agriculture from the Secretary of the Interior for technical advice regarding the management of the reserves, which comprise an area of 46,828,449 acres.

During the year the field work necessary to a working plan for the Black Hills Forest Reserve was completed. It occupied a party of 16 men for four months, and included a thorough study of the Western Yellow Pine, or Bull Pine, of local questions of lumbering, grazing, and fire, and of those conditions generally which must determine the best management of the reserve. The total stand of timber and young growth was measured upon 10,234 acres and the rate of growth of 4,500 trees was ascertained, to serve as a basis for calculations of volume and yield. The working up of these results is nearing completion. There is no other forest in the United States in which practical forestry is more urgently needed, or in which results of such importance may be more easily achieved than in the Black Hills Forest Reserve. It is practically a pure forest of Western Yellow Pine, remarkable for the abundance of its reproduction and its thorough adaptation to practical forestry. Upon its preservation depends the timber to supply a great and rapidly growing mining industry which has built up and now maintains the prosperity of this region. Its effect upon the water supply, without which mining in the Black Hills must fail, offers a most striking example of the influence of forests upon stream flow. Already vast expenditures have been made to bring from other streams the indispensable water supply formerly taken in abundance from sources which have failed since the destruction of the forest.

Examinations preparatory to working plans were made of the Prescott, Big Horn, and Priest River forest reserves, a total area of 2,249,600 acres.

Next in importance among the duties of this section to the work in

the Federal forest reserves is the preparation of working plans for practical forestry in the New York State Forest Preserve, the result of a request by the Forest, Fish, and Game Commission in the winter of 1900. The purpose of this request was to enable the commission to present to the legislature an authoritative statement of how the preserve should be handled under practical forestry and upon it to base definite recommendations.

The working plan for township 40, Totten and Crossfield purchase, Hamilton County, N. Y., was completed, and has recently appeared as Bulletin No. 30 of the Division of Forestry. It is the result of the most careful study on the ground which has ever served as the basis for a forest working plan in this country. This study shows that township 40 is fully adapted for practical forestry, and that it contains a sufficient quantity of accessible mature timber to insure profitable lumbering under conservative methods. The original forest which still covers the township includes large quantities of mature and over-mature trees, the prompt marketing of which is necessary both in order to avoid direct loss by decay and to improve the conditions of growth for the young trees, which must make the forest of the future. The working plan for township 40 outlines in detail a safe, practicable, and profitable method of lumbering the soft-wood timber, which will improve the condition of the forest, protect the sources of water supply, and leave untouched the value and beauty of the township as a public preserve. This working plan was made under a State appropriation of $2,000 for the expenses of the agents of the Division of Forestry while in the field. During its last session the New York legislature appropriated $3,500 more to prepare working plans for townships 5, 6, and 41. This work was begun in May of the present year and continued throughout the summer.

FOREST MEASUREMENTS.

No small part of the work of the Section of Working Plans lies in the computation of results obtained in the field by both this section and the Section of Special Investigations in its studies of commercial trees. During the year this work comprised the calculation and casting into final tables of measurements of the total stand of young and old trees on about 19,000 acres, and of the rate of growth of over 9,000 trees.

EXPENDITURES.

The total expenditures during the year by the Section of Working Plans were $29,088.73, or 32.9 per cent of the total appropriation. Of the $12,775 contributed by private owners as their share of the expenses in the preparation of working plans begun during the year 1900–1901, $1,785.36 had been expended at the end of the fiscal year.

SECTION OF SPECIAL INVESTIGATIONS.

This section has a wide and increasing field. It includes many important lines of investigation, among which are studies of commercial trees, forest fires, grazing, log scales, forests and water supply, the compilation of forest histories, and the investigation of forest products. The section is confronted by a number of forest problems whose solution is of direct and urgent importance to the best development of our natural resources.

STUDIES OF COMMERCIAL TREES.

The studies of Redwood and of Red Fir and Western Hemlock, continued from last year, have been completed. These studies, which embody the results of careful and very extensive investigations on the ground, will be prepared for publication during the current year.

Incident to the preparation of a working plan for the Black Hills Forest Reserve by the Section of Working Plans, a very extensive study of the Western Yellow Pine was carried on. This study, the first made by the Division of Forestry, will form the basis for a contribution to the knowledge of a most important timber tree. The collection of similar data for this tree was begun toward the close of last year in the Prescott Forest Reserve, Arizona.

A careful study was made of the Big Tree groves in the California sierras, and their ownership was ascertained. In view of the incomplete information hitherto available for these groves, this study is of great value, both to show their comparative suitability for reserves and for the general knowledge of the tree. A number of groves, hitherto unrecorded, were examined and mapped in the course of an investigation of the northern part of the Sierra Forest Reserve.

Of the monographic studies of Red Cedar, White Cedar, and Bald Cypress, completed last year by the late Dr. Charles Mohr, that of Red Cedar is now in press. Dr. Mohr had also completed studies of eleven of the more important oaks. Frequent requests are received for precisely the information given in these unpublished monographs.

Incident to a working plan for the tract of the Sawyer and Austin Lumber Company in Arkansas, valuable data were collected for the Loblolly and Shortleaf Pines, while a thorough study of the Longleaf Pine in South Carolina was begun.

In the preparation of a working plan for a forest tract in the northern Adirondacks, the growth and habits of the Balsam were investigated. The importance of this tree for the manufacture of paper pulp is increasing steadily with the decreasing supply of spruce. A similar study of the Balsam was begun in Maine as a part of the field work necessary to the working plan for the tract of the Great Northern Paper Company.

In the preparation of a working plan for the domain of the University of the South, at Sewanee, Tenn., the study of the important hardwoods of that region was well begun; while a large number of measurements were obtained for White Ash, Hickory, Cow Oak, and White Oak, during the making of a working plan for the tract of the Deering Harvester Company in Missouri.

Incident to a working plan for a tract in Massachusetts an important study of the second-growth hardwoods of that region was begun, and has been extended widely during the year over second-growth lands in other portions of New England.

COOPERATIVE WORK.

In cooperation with the U. S. Geological Survey, a study was made of the region of the proposed Appalachian Forest Reserve. This investigation was specifically authorized by Congress and had for its object to ascertain the suitability of the region examined for a National forest reserve, the probable cost of such a reserve, and to consider the direct and indirect returns under practical forestry. One of the important results of the work is a map, showing the woodland, tim-

berland, and agricultural and other lands within the area of 9,600,000 acres examined.

An examination of 3,049,120 acres in the Sierra Forest Reserve was made, also in cooperation with the U. S. Geological Survey. Special attention was given to the kind, quality, distribution, and stand of the forest trees. The effects of lumbering, fire, and sheep grazing on the forest were also noted. A map which accompanies the report shows the distribution of forest and other lands, the density of the forest, and the location of lumbered, burned, and grazed areas.

FORESTS OF NEBRASKA AND TEXAS.

An extensive investigation of the present forest condition of Nebraska was begun and carried far enough to demonstrate the practical feasibility of replanting large areas hitherto believed to be permanently treeless.

An elaborate report on the forests of Texas was completed and will be published during the coming year.

STUDY OF SHEEP GRAZING.

During the season 12 of the Federal forest reserves were examined with special reference to the effects of grazing on the forest. The result of this work was to develop, in harmony with the conclusions reached after similar study in the past, a workable system of proposed regulations, whose enforcement would sustain equally the welfare of the forest, of the uses of water, and of the grazing interests.

STUDIES OF VARIOUS FOREST SUBJECTS.

Forest fires.—An extended study on the ground was made of forest fires and reproduction in the North Park and Medicine Bow Mountains of Colorado. Special attention was given to this subject in the reserves of Arizona, California, Oregon, Washington, and Wyoming.

In the historical study of forest fires, records of about 1,800 fires were added during the year, bringing the total number recorded to over 10,000.

Forest history.—Histories of lumbering in Mississippi, Louisiana, and Texas were undertaken, and that of New York was pushed far toward completion.

Log scales.—The first volume of the Woodman's Handbook is nearing completion. It contains information useful to foresters, forest students, lumbermen, and laymen. A feature of the preparatory work for the Handbook is an exhaustive collection of American log scales, with a discussion of their comparative accuracy.

Forest products.—A useful report has been prepared on the maple-sugar industry. It deals with the history and distribution of the industry and with methods of manufacture of the pure and unadulterated product.

FOREST EXHIBITS.

The forest display installed at the Paris Exposition in the spring of 1900 remained on exhibition during the remainder of that calendar year. The general purpose of the exhibit was to illustrate the relation of forests to agriculture. Its most notable part consisted of 92

transparencies, bromide enlargements, and maps, some of the first being the largest glass pictures ever made. The exhibit was awarded a gold medal.

The forest exhibit of the Department of Agriculture at the Pan-American Exposition was prepared in the Division of Forestry, and was installed by June 20, 1901. It consisted chiefly of colored transparencies and bromide enlargements and maps, and illustrated the general progress and condition of forestry and forests in the United States.

MISCELLANEOUS.

Much attention was given during the year to the photographic collections and to the identification of botanical specimens submitted by the various Divisions, by the National Museum, and by several State experiment stations.

With the Bureau of Plant Industry, a plan for labeling trees on the grounds of the Department was devised, a list of names was supplied, and attention was given to the placing of the labels.

EXPENDITURES.

The total expenditures of the Section of Special Investigations were $21,616.73, or 24.4 per cent of the total appropriation.

SECTION OF TREE PLANTING.

There has been notable development in the work of this section during the year. The plan of cooperative planting when first announced drew many applications for small tracts, principally in the prairie States. The practical assistance given in these cases and the better understanding of the purpose and results of economic tree planting have since drawn applications from a wider territory and for larger tracts. Owners of unprofitable cleared or treeless land are beginning to see in the cooperation offered by the Bureau a means of rendering their lands valuable, and are applying for assistance in planting.

The proof given by examples on the ground that commercial plantations are profitable in the Middle West has started a movement toward large plantations of timber for the production of fence posts, telegraph poles, and railroad ties. Private landowners are entering this work in increasing numbers every year. Several railroad companies are seriously considering large plantations of forest trees, and are already in consultation with the Bureau.

The study of the encroachment of forests on the plains has already shown that portions of the semiarid public lands, wholly unfit for farming and of little value for grazing, can be forested at reasonable expense. If further investigation shows that large areas of such land can be reclaimed in this way, as it seems altogether likely to do, a vast field will be opened for useful work.

COOPERATIVE TREE PLANTING.

The applications for assistance in forest planting numbered 148 for the fiscal year; 46,145 acres were examined and detailed planting plans were prepared for 5,785 acres. The greater number are for small tracts. There is a conspicuous increase in the number of large tracts for which planting plans are asked. Applications are on file

for several tracts of over 5,000 acres each. In other instances the planting begun on small areas will be extended over hundreds and even thousands of acres as rapidly as the facilities for planting will permit. Requests have been received for planting plans for commercial plantations in the treeless plains, for the production of fence posts, telegraph poles, and railroad ties. Fertile agricultural land is employed for these purposes, there being no longer any question that such land can, under certain conditions, be used as profitably for a forest as for an agricultural crop.

For all this planting the Bureau of Forestry furnishes direction and advice. The planting material and the necessary labor are invariably furnished by the owners.

STUDIES OF PLANTED WOODLANDS.

Forest measurements were made in 32 of the largest commercial plantations in Nebraska, Iowa, South Dakota, and Kansas, including the Hunnewell, Munger, and Yaggy plantations, and that of the Kansas City, Fort Scott and Memphis Railroad. These results are of the highest value, not merely in showing the growth of some plantations in these regions, but especially because they exhibit also the profitable nature of these undertakings. A bulletin embodying the results of these studies is in preparation.

FOREST ENCROACHMENT ON THE PLAINS.

This investigation, tentatively begun a year ago, was continued in nearly all the States of the Great Plains. The immense area to be covered will make the investigation a long one, but it has already yielded important information on tree planting in many localities. The work was done mainly in connection with the field work for cooperative tree planting and the studies of planted woodlands, but in May, 1901, a careful investigation was begun in Nebraska to determine the possibility of reclaiming portions of the nonagricultural public lands by judicious planting, and by protection from fire and grazing. This study was carried far enough to show that portions of the sand hills, heretofore considered almost worthless, can be forested with valuable timber at comparatively small expense.

Much attention was given during the year to the spread of information on tree planting. Circular No. 22 was revised and enlarged, and more than 10,000 copies were sent out. A Farmers' Bulletin, "Tree planting on rural schoolgrounds," was prepared and submitted for publication. Forty mimeographed circulars giving directions for the planting and care of various species of forest trees were prepared, and a special mailing list of 2,000 names was compiled. Public lectures, illustrated with lantern slides, were frequently given by the members of the section while in the field.

EXPENDITURES.

The expenditures for the Section of Tree Planting during the year were $9,523.61, or 10.8 per cent of the total appropriation.

SECTION OF OFFICE WORK.

PERSONNEL.

On July 1, 1900, the number of employees in the Section of Office Work was 14. During the year this number was increased by the

appointment of 3 stenographers, a property clerk, 2 library assistants, 2 photographers, 2 laborers, and 2 charwomen, being a total of 26 employees in this section at the close of the fiscal year.

In addition to the above, the Section of Office Work carried on its rolls an accountant, who was assigned to duty with the division of accounts.

The total amount expended for salaries in this section was $19,233.39.

LIBRARY.

The main collection of forestry literature still remains in the Department Library, as the quarters assigned for the library of the Bureau are inadequate to store this collection. Only such works, therefore, as are most frequently referred to are kept in the Bureau library. There are at present 110 bound volumes and 1,300 pamphlets in the Bureau collection. During the year 3,200 newspaper clippings were purchased, and these have been numbered, classified, indexed, and filed. A large part of the old subject index has been revised and copied, and, in addition, 15 French, German, and English periodicals have been regularly indexed. A file has been kept of all Congressional bills, acts, documents, and reports bearing on forest topics.

The photograph collection of the Bureau numbers 4,968 prints, of which 2,000 have been fully described, labeled, and classified, and are ready to be catalogued; 567 lantern slides were added to the collection. A special case has been made to hold the slides, and they will be arranged to correspond with the photographs. During the past year the library staff was too limited to record properly the mass of collected material, but it is expected that during the coming year complete records will be kept, all the accumulated material catalogued, and current accessions regularly disposed of.

ACCOUNTS.

The following statement, prepared by the accountant, gives the expenditures in the different sections of the Division for the fiscal year July 1, 1900, to June 30, 1901:

Expenditures for fiscal year 1900–1901.

Section.	Salaries.			Expenses.			Total expenditure.	Per cent of total appropriation.
	Amount.	Per cent of total salaries.	Per cent of total appropriation.	Amount.	Per cent of total expenditures.	Per cent of total appropriation.		
Chief of Division	$2,500.00	3.9	2.8				$2,500.00	2.8
Working plans	22,933.02	35.9	25.9	$6,155.71	24.9	7	29,088.73	32.9
Special investigations	14,180.38	22.2	16	7,436.35	30.2	8.4	21,616.73	24.4
Tree planting	5,022.48	7.9	5.7	4,501.13	18.3	5.1	9,523.61	10.8
Office work	17,136.43	26.8	19.4	2,338.43	9.5	2.6	19,474.86	22
Photographs	2,096.96	3.3	2.4	1,880.13	7.6	2.1	3,977.09	4.5
Instruments				2,338.98	9.5	2.6	2,338.98	2.6
Total	[a]63,869.27	100	72.2	24,650.73	100	27.8	88,520 00	100

[a] The large percentage of the total appropriation paid for salaries requires explanation. The proportion between 72.2 per cent paid for salaries and 27.8 per cent paid for expenses does not represent the relative importance of field and office work in the activity of the Bureau. A very considerable part of the field expenses was met by the contributions of owners of forests for which plans were made. It should be remembered also that the cost of computing the field results, which appears wholly under the heading of salaries, is necessarily very great.

CORRESPONDENCE AND PUBLICATIONS.

Close attention was given to the prompt handling of correspondence. With few exceptions action was taken and acknowledgment made within forty-eight hours after the receipt of any communication. The increase in the amount of correspondence recorded for the previous fiscal year was maintained. The correspondence for the year numbered 15,051 letters, as against 8,800 for the preceding year.

During the year there were published three bulletins (25,000 copies), two extracts from Yearbook (30,000 copies), the Report of the Forester for 1900 (8,000 copies), and six press bulletins (19,100 copies), a total of 82,100 copies. In addition there were reprinted 1,000 copies of Bulletin No. 22; 4,000 of Bulletin No. 28; 2,000 of Circular No. 12; 2,000 of Circular No. 21; and 22,000 of Circular No. 22, to which should be added a Congressional reprint of Bulletin No. 24, "A Primer of Forestry, Part I" (35,000 copies), of which 20,000 copies were placed at the disposal of the Division of Forestry. There were distributed in all 81,575 copies.

MAILING LIST.

In the early part of the fiscal year a radical change was made in the manner of distributing bulletins. Because of the largely increased demand, it was decided to forward them only upon application. Notices of their appearance, with brief descriptions, are now sent to those persons whose names are on the mailing list of the Bureau, and applications are honored in the order of their receipt. The annual report of the Forester, the circulars of the Division, and the reprints of its contributions to the Yearbook of the Department are sent to all addresses on the mailing list, as heretofore.

PHOTOGRAPHIC LABORATORY AND FIELD INSTRUMENTS.

At the beginning of the fiscal year the photographic laboratory was placed in a satisfactory working condition, and excellent work was done throughout the year; 4,778 films and plates were developed; 6,632 prints were made, and altogether 16,474 items of work were performed.

During the year the supply of field instruments was largely increased, the total amount expended for this purpose being $2,338.98. At the beginning of the present fiscal year the Bureau was well furnished with the tools necessary for its work in the field.

QUARTERS.

On May 1, 1901, the Division was removed to more commodious and satisfactory quarters in the Atlantic Building, 930 F street NW.

EXPENDITURES.

The expenditure for the Section of Office Work during the year was $28,290.93, or 31.9 per cent of the total appropriation.

WORK FOR THE ENSUING YEAR.

FOREST MANAGEMENT.

PRIVATE LANDS.

It is expected that working plans will be completed for 5 timber tracts, upon which field work has already been begun. These tracts

have a total area of 628,000 acres. A working plan for the 60,000-acre tract of the Okeetee Club, near Ridgeland, S. C., will be begun in the early winter.

Preliminary examinations will be made of about 1,000,000 acres of Longleaf Pine land in Texas, 50,000 acres of Longleaf Pine land in South Carolina, 16,000 acres of hardwood land in North Carolina, 60,000 acres of hardwood land in Tennessee, 10,000 acres of Shortleaf Pine land in Georgia, and 17,000 acres of second-growth hard wood land in New York, and will be followed by working plans for some of these tracts. As many other examinations as possible of private forest lands, for which assistance has been requested, will be made. It is intended to devote more attention to the study of wood lots than has been practicable during the past year.

PUBLIC LANDS.

Preliminary examinations will be made of 4 of the Federal forest reserves, and the field work incident to working plans will be begun upon at least 2 of them. Plans already in preparation will be continued or completed.

INSPECTION.

Markings and inspection of lumbering will continue upon those tracts in the Adirondacks which are under the oversight of the Bureau, upon the 6,000-acre domain of the University of the South, at Sewanee, Tenn., and upon a 14,000-acre tract near Lenox, Mass. Markings and inspection will be begun upon the 14,000-acre tract of Mr. E. H. Harriman, in New York, and upon other lands for which they are requested and advised in working plans already prepared.

COMPUTATION.

An effort will be made to complete the working up of all field results obtained during the year. The quantity to be handled exceeds considerably that of the fiscal year 1900–1901.

FOREST INVESTIGATION.

STUDIES OF COMMERCIAL TREES.

Studies of important hardwoods will be carried on in the Smoky Mountains and the Cumberland Plateau. The investigation of second-growth hardwoods in New England and of Balsam in Maine will be continued, while a study of the White Pine in Michigan will be begun. Western Yellow Pine will be studied in South Dakota and Arizona, and Sugar Pine and the Bristle-Cone Fir in California.

Monographic studies of Southern timber trees will be continued, and will include the hickories, additional important oaks, ashes, elms, beech, chestnut, tulip poplar, lindens, and sweet gum.

STUDIES OF NORTH AMERICAN FORESTS.

Forest distribution in Nebraska, Colorado, and Montana will be investigated. The study of the influence of forest cover on the run-off of streams, begun in southern California during the last fiscal year, will be continued.

At the request of the Michigan State Forest Commission a study

will be made of State forest lands in Michigan, in order to devise a plan for their management. The forests of the Sacramento Mountains of New Mexico will be studied on the ground.

GRAZING.

Studies of the effect of grazing on the forest will be continued in Wyoming (Yellowstone Timberland Reserve and Teton Forest Reserve), in southern New Mexico (Sacramento Mountains), in the southern and central California forest reserves, and in Montana.

STUDY OF FOREST PRODUCTS.

In cooperation with the Bureau of Chemistry, important investigations will be begun of native trees of the United States and Philippine Islands yielding commercial tan barks, resins, and gums. About fifty species will be studied during the year. The recent establishment in the Bureau of Chemistry of a dendro-chemical laboratory makes this investigation possible.

A study will be made of the production of commercial resins by Southern pines, particularly of the Longleaf Pine, and an effort will be made to devise an improved method of tapping. The need of a less destructive method than the one now in use is greatly felt.

An investigation of the supplies of railway timber available from forest plantations, especially in the Middle West, will be undertaken. Special attention will be given to the study of timber trees producing railway ties in the shortest time.

A study of the conditions, causes, and prevention of decay in railroad and other timber will be undertaken on a large scale in collaboration with the Bureau of Plant Industry. This is work of the first importance

COOPERATIVE WORK.

Forest descriptions will be made of additional areas in the region of the proposed Appalachian Forest Reserve, and in the southern portion of the Sierra Forest Reserve of California, in cooperation with the U. S. Geological Survey.

A preliminary forest description and study of important forest problems are to be undertaken in Vermont.

In cooperation with the Maryland geological survey forest descriptive work will be continued covering 4 of the best timbered counties of the State.

STUDY OF FOREST FIRES.

Studies of forest fires will be made this year in Wyoming, California, New Mexico, Idaho, Michigan, Maine, and other States.

The collecting of forest-fire records will be continued, and will include the examination of a large number of Western papers.

PROPOSED INVESTIGATIONS.

Other lines of investigation which will be undertaken, if the resources of the Bureau will permit, are as follows:

A study of various woods, with a view to determining those suitable for the manufacture of excelsior.

Studies and experiments to show the fuel value of various woods as compared with that of hard and soft coals.

TREE PLANTING.

Extensive forest measurements will be made in the planted woodlands of New England and the Eastern States, and additional facts will be collected in the plantations already studied in the Middle West. The study of forest encroachment on The Plains will be continued, with Nebraska as one of the principal fields. As many preliminary examinations for planting plans as possible will be made. Some of the applications are for very large tracts, notably one of 8,000 acres in Wisconsin and one of 160,000 acres in Washington. The demand for work in tree planting has already far outgrown the resources of the office, and is still increasing.

REPORT OF THE STATISTICIAN.

U. S. DEPARTMENT OF AGRICULTURE,
DIVISION OF STATISTICS,
Washington, D. C., November 4, 1901.

SIR: I have the honor to submit herewith a report of the work of the Division of Statistics for the fiscal year ended June 30, 1901.

Respectfully,

JOHN HYDE,
Statistician.

Hon. JAMES WILSON, *Secretary.*

WORK OF THE YEAR, WITH RECOMMENDATIONS.

With a smaller appropriation available for its work than was expended for a like purpose in any fiscal year from 1891 to 1898, inclusive, the Division of Statistics has endeavored to meet the ever-growing demand for statistics of the agricultural industry. It handled during the fiscal year nearly 2,500,000 returns from a corps of correspondents numbering about 250,000, the results appearing in 13 ordinary and 6 special reports, of which over 1,500,000 copies were printed.

The work has consisted largely, as in past years, of the preparation of reports relative to the principal products of the soil, including the extent and geographical distribution of the area of production, the condition and prospects of the crop during the growing season, and the quantity, quality, and disposition of the product harvested. These reports, together with the latest information concerning the crops of foreign countries and other statistical matter of general interest, have been published in the monthly Crop Reporter. Of this publication there were printed during the year a total of 1,434,000 copies. This number was utterly inadequate for the requirements even of the Department's statistical correspondents, and I earnestly recommend the printing of at least 250,000 copies of each future issue. The Department's statistical correspondents render most valuable service without compensation, and while the impracticability of printing special reports in sufficiently large editions to permit of their general distribution among so numerous a body of men is fully recognized, correspondents should surely be given a publication embodying with the results of their own work so much other timely information of interest and value to them.

SPECIAL REPORTS.

The special reports prepared or issued during the year comprise the following: "The course of prices of farm implements and machinery for a series of years," by George K. Holmes; "The cotton crop

of 1899–1900," by James L. Watkins; "Wheat growing and general agricultural conditions in the Pacific coast region of the United States," by Edwin S. Holmes, jr.; "The cereal crops of European Russia in 1900," by E. T. Peters; "Rates of charge for transporting garden truck, with notes on the growth of the industry," by Edward G. Ward, jr., and Edwin S. Holmes, jr.; and "Wages of farm labor in the United States." Of these publications there were printed 93,000 copies, making the total number of copies of publications issued by this Division during the year 1,527,000, not including the reprint of the article on the "Influence of rye on the price of wheat," by E. T. Peters, which appeared in the Yearbook of the Department for 1900, nor the reprint of the statistical appendix to the Yearbook, which is mainly the work of the experts of this Division.

A SPEEDIER DISSEMINATION OF INFORMATION.

For several years past determined efforts have been made, with the cooperation of the Public Printer, to expedite the publication and distribution of the monthly crop reports, so that as little time as possible might intervene between the issue of the telegraphic summary and the receipt in the most remote agricultural county of the complete report. On May 31, 1901, however, at a time when the keenest interest was prevailing throughout the entire South as to the extent of the newly planted acreage of cotton, a card containing the most important points of the Statistician's report on the subject was mailed to 24,000 post offices in the Southern States within three hours of the publication of the telegraphic summary, with a request that postmasters would give it prominent display in their offices. This was done largely as an experiment, and so successful was it that within a few weeks its operation was extended, with the most gratifying results, to the grain reports. A farmer has now only to visit the nearest post office to see the Statistician's latest report on the principal crops, and the measures adopted by the Public Printer and the Postmaster-General have reduced to a minimum the time necessary for placing this important information within the farmer's immediate reach.

To attain this result the cards are addressed before they are printed, and the reading matter, with the exception of the actual figures of the report, is put into type. A branch printing office is established in a private room connecting with that of the Statistician, and as rapidly as the official figures are arrived at they are inserted in the card. This is all done within the hour preceding the issue of the telegraphic report, and during that time no employee having access to the figures is allowed to leave the building or have communication with anyone outside. Promptly on the first stroke of the hour—12 at noon in the case of cotton, and 4 p. m. in that of grain—a summary of the report is handed to special operators of the Western Union and Postal Telegraph Cable companies, representatives of the press, and other applicants, and only a few moments elapse before it is being read in all the commercial centers of the world. Concurrently with the official promulgation of the figures the printing presses are set in motion, and almost as fast as they leave the press the cards for display in the 77,000 post offices of the country, previously arranged by States, and ranging in number from 149 for Rhode Island to 5,255 for Pennsylvania, are sent to the Washington post office, where special provision is made for their prompt dispatch.

FOREIGN CROP INTELLIGENCE.

The importance to the American farmer and to the country in general of trustworthy information concerning the crops of competing countries, and especially that of wheat, needs no demonstration. Regulate the extent of the wheat acreage in the United States as we will, improve the facilities for the transportation of the grain as we may, the price of this product must inevitably continue to depend largely on the production of other countries, the contribution of the United States to the wheat production of the world having rarely reached and but once exceeded 25 per cent of the whole.

While the cultivation of friendly relations with the statistical offices of foreign Governments has secured for the Department during the last two years facilities for reporting upon foreign crops superior to those in its possession at any previous period in its history, the need has been felt of a still more prompt transmittal to this office of authoritative information relative to the condition and prospects of such crops as enter into competition with those of the United States in the world's markets.

Negotiations with the Governments of various important grain-producing countries of Europe, and also with that of the Dominion of Canada, looking to a telegraphic interchange of crop reports similar to that already in operation between the United States and Hungary, were entered upon during the closing days of the fiscal year covered by this report, and it is not an improper anticipation of the Statistician's report for the year 1901–1902 to state that those negotiations have now reached a stage at which it can be stated with almost absolute certainty that the growing season of 1902 will see the American farmer placed in as prompt possession of reliable statistics concerning the principal grain crops of foreign countries as he is of those of the United States.

DEMAND FOR ENLARGEMENT OF SCOPE OF WORK.

There is an urgent demand from many different directions for a substantial broadening of the scope of the work of this Division. Only the insufficiency of the appropriation prevents the live stock and live-stock products of the country—an interest so enormous that after satisfying the needs of our own large population there was available last year for export over $250,000,000 worth of its products—from being reported upon as promptly and fully as are the cotton, corn, and wheat crops of the country. The annual fruit crop, the egg and poultry industry, beet sugar flaxseed, and other products of great and growing importance also claim attention. The Department has already in operation all the agencies necessary to the collection, as often as may be necessary, of the required information relative to these important interests, and all that remains to be done is to provide the means for the employment of such additional experts and statistical compilers as may be necessary to the prompt compilation and analysis of so large an amount of additional statistical data.

NEED OF A BUREAU ORGANIZATION.

Attention is once more invited to the fact that the statistical work of the Department has far outgrown that divisional organization which was formerly entirely adequate to its requirements, but is now greatly

restricting its usefulness. Few Government bureaus, civil or military, have their operations extending, as has this office, into the remotest and most sparsely populated civil divisions of the country. Were the correspondents employed in the collection of crop intelligence paid a fair rate of compensation for the service they render, the cost of maintaining an organization five times as numerous as the census enumerators would call attention, as probably nothing else will, to the magnitude of the Department's statistical service. But the fact that the reports upon which the work of the Division of Statistics so largely depends are made without compensation in no wise diminishes the amount of labor involved in their compilation and analysis; indeed, the list of correspondents is more difficult to keep up to the necessary standard in number, if not in quality, than it would be if it consisted of persons adequately remunerated for their services. The new directions in which the work of the Division might be made of service to the agricultural interests of the country if its organization were made more elastic by its conversion into a bureau and the appropriation for its maintenance were made more adequate to its needs are so numerous that an addition of $50,000 to the present appropriation would not be an excessive provision for the new work that could at once be undertaken.

THE STATISTICAL LIBRARY.

While there is no branch of statistics having any close relation to the agricultural industry that is not more or less adequately represented in the Department's statistical library, as regards the literature of prices it is believed to be the best equipped library in the country, and no reasonable expenditure that may be necessary to maintain its present high standard should be withheld. Its card index to agricultural statistics is also pronounced by visitors who have occasion to consult it to be exceptionally complete and well arranged, and reasonable provision for its continuation is recommended.

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57TH CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { DOCUMENT No. 29.

EXPENDITURES IN THE DEPARTMENT OF AGRICULTURE.

LETTER

FROM

THE SECRETARY OF AGRICULTURE,

TRANSMITTING

A DETAILED STATEMENT OF THE EXPENDITURES OF ALL APPROPRIATIONS FOR THE FISCAL YEAR ENDING JUNE 30, 1901, INCLUDING SUPPLEMENTAL ACCOUNTS TO OCTOBER 14, INCLUSIVE.

DECEMBER 2, 1901.—Referred to the Committee on Expenditures in the Department of Agriculture and ordered to be printed.

DEPARTMENT OF AGRICULTURE,
OFFICE OF THE SECRETARY,
Washington, D. C., November 26, 1901.

SIR: I have the honor to present herewith, in conformity to law, a detailed statement of the expenditures of all appropriations for the Department of Agriculture for the fiscal year ending June 30, 1901, including supplemental accounts to October 14, inclusive.

Very respectfully,

JAMES WILSON,
Secretary.

The SPEAKER OF THE HOUSE OF REPRESENTATIVES.

Expenditures of Department of Agriculture for year ending June 30, 1901

SALARIES.

Name.	Amount.	Name.	Amount.
James Wilson	$8,000.00	Milton Whitney	$2,500.00
J. H. Brigham	4,500.00	F. Lamson-Scribner	2,500.00
W. L. Moore	5,000.00	Gifford Pinchot	2,500.00
D. E. Salmon	4,000.00	E. B. Garriot	2,500.00
Cleveland Abbe	3,000.00	H. J. Cox	2,500.00
Frank H. Bigelow	3,000.00	A. M. Farrington	2,500.00
Jno. Hyde	3,000.00	E. A. de Schweinitz	2,500.00
Andrew Geddes	2,500.00	A. J. Henry	2,500.00
F. L. Evans	2,500.00	V. A. Norgaard	2,500.00
A. D. Melvin	2,500.00	A. F. Woods	2,325.00
G. W. Hill	2,500.00	H. W. Wiley	2,289.40
F. V. Coville	2,500.00	H. E. Alvord	2,285.60
L. O. Howard	2,500.00	C. W. Stiles	2,250.00
C. H. Merriam	2,500.00	H. E. Williams	2,250.00
B. T. Galloway	2,500.00	A. Zappone	2,000.00

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

SALARIES—Continued.

Name.	Amount.	Name.	Amount.
S. R. Burch	$2,000.00	G. W. Hay	$1,400.00
J. B. Bennett	2,000.00	H. J. Penrod	1,400.00
C. B. Lower	2,000.00	Theo. T. Moore	1,400.00
H. C. Frankenfield	2,000.00	H. L. Heiskell	1,400.00
Alex. G. McAdie	2,000.00	J. J. Bain	1,400.00
E. A. Beals	2,000.00	Jno. C. Stewart	1,400.00
Jas. Berry	2,000.00	Henry Pennywitt	1,400.00
D. J. Carroll	2,000.00	M. C. Bennett	1,400.00
J. P. Church	2,000.00	H. C. Kimball	1,400.00
E. D. Yerby	1,800.00	Jno. C. Foy	1,400.00
Jos. A. Arnold	1,800.00	Sophia A. Benter	1,400.00
R. W. Reese	1,800.00	C. B. Tuch	1,400.00
E. B. Jones	1,800.00	M. B. Waite	1,350.00
L. H. Dewey	1,800.00	R. W. Hickman	1,331.50
T. S. Palmer	1,800.00	McP. Reynolds	1,300.00
W. A. Taylor	1,800.00	Emma B. Hawks	1,232.70
E. E. Ewell	1,800.00	M. Haas	1,223.09
E. C. Schroeder	1,800.00	A. G. Guthridge	1,200.00
R. A. Pearson	1,800.00	Thos. Ray	1,200.00
Jno. R. Mohler	1,800.00	M. Helen Burr	1,200.00
H. H. Gerdes	1,800.00	C. K. Bragden	1,200.00
Geo. F. Thompson	1,800.00	E. H. Stevens	1,200.00
L. J. Briggs	1,800.00	Virginia Miller	1,200.00
T. B. Harrison	1,800.00	M. B. Zimmerman	1,200.00
C. L. Marlatt	1,800.00	F. H. Wagner	1,200.00
J. R. Robinson	1,800.00	B. M. Dodson	1,200.00
D. T. Maring	1,800.00	M. T. Chapman	1,200.00
Jas. R. Cook	1,800.00	Flora Schmidt	1,200.00
F. M. Cleaver	1,800.00	W. M. King	1,200.00
R. B. Handy	1,800.00	H. R. Smedes	1,200.00
G. K. Holmes	1,782.95	V. R. Wharton	1,200.00
O. W. Price	1,648.40	C. B. Finckel	1,200.00
G. B. Brackett	1,616.85	W. W. Tracy, jr	1,200.00
M. Marjorie Brigham	1,600.00	Otto Heidemann	1,200.00
W. C. Pennywitt	1,600.00	M. A. Champney	1,200.00
W. W. Jones	1,600.00	E. R. Preble	1,200.00
J. A. Harvey	1,600.00	D. A. Passmore	1,200.00
L. F. Harrington	1,600.00	A. M. Winfield	1,200.00
Geo. E. King	1,600.00	Mary T. Dent	1,200.00
W. W. Long	1,600.00	M. H. Mahan	1,200.00
C. A. Leith	1,600.00	Mary G. Marshall	1,200.00
A. J. Pieters	1,600.00	C. F. Morris	1,200.00
Theo. Pergande	1,600.00	M. A. S. Coleman	1,200.00
Allen Dodge	1,600.00	A. H. Kinnear	1,200.00
W. G. Bigelow	1,600.00	Wm. Berry	1,200.00
Albert Hassall	1,600.00	Harry L. Hill	1,200.00
Robt. Seyboth	1,600.00	R. F. de Grain	1,200.00
Frank Gillam	1,600.00	E. E. Simpson	1,200.00
P. C. Day	1,600.00	J. H. Melton	1,200.00
Geo. E. Hunt	1,600.00	W. D. Porter	1,200.00
J. H. Jones	1,600.00	R. D. Meston	1,200.00
C. B. Clark	1,582.88	S. A. Potter	1,200.00
B. D. Stallings	1,575.47	H. W. Smith	1,200.00
A. K. Fisher	1,500.00	J. S. Whiteside	1,200.00
H. W. Olds	1,500.00	Jas. M. Watson	1,200.00
Jas. A. Emery	1,496.20	Arthur Thompson	1,200.00
Jas. W. Wilson	1,493.75	B. P. N. Spencer	1,200.00
C. M. Daugherty	1,465.20	Benj. A. Bluden	1,200.00
Carleton P. Ball	1,450.00	E. M. Mattison	1,200.00
Jas. E. Jones	1,400.00	E. A. Brown	1,200.00
H. N. Price	1,400.00	C. J. Jones	1,200.00
Anna A. Houseman	1,400.00	W. M. Husson	1,200.00
Carrie L. Du Bois	1,400.00	Clinton Ashton	1,200.00
M. McCutchen	1,400.00	Homer W. Clough	1,200.00
F. C. Cox	1,400.00	Ruby S. Hotze	1,185.33
J. H. Hendrick	1,400.00	Jas. M. Pickens	1,160.85
Geo. W. Bauman	1,400.00	C. C. Carroll	1,145.10
E. G. Ward, jr	1,400.00	Frank O. Stetson	1,134.79
J. P. M. Haas	1,400.00	H. M. Kendrick	1,100.00
D. W. Stier	1,400.00	Nellie F. Houghton	1,097.28
Frank Benton	1,400.00	A. I. Mudd	1,088.04
F. E. L. Beal	1,400.00	A. McC. Ashley	1,067.20
Mary Sullivan	1,400.00	C. L. Shear	1,065.00
Evelyn Lyons	1,400.00	E. S. Steel	1,050.00
F. N. Gregory	1,400.00	C. H. Greathouse	1,050.00
W. S. D. Haines	1,400.00	E. L. Ogden	1,032.80
S. W. Beals	1,400.00	Almont Barnes	1,005.31
J. T. Foy	1,400.00	D. Marean	1,004.33
G. W. Smith	1,400.00	Helen E. Gray	1,000.00
F. O. Pugh	1,400.00	Mary E. Williams	1,000.00
J. C. Ashton	1,400.00	W. F. Tomlinson	1,000.00

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

SALARIES—Continued.

Name.	Amount.	Name.	Amount.
I. S. Pennybacker, jr	$1,000.00	Danl. F. O'Neil	$840.00
M. M. Cannon	1,000.00	Edw. Dillon	840.00
M. E. Edwards	1,000.00	Hermann Perle	840.00
M. C. Stoddard	1,000.00	Wm. Patrick	840.00
M. E. Thorn	1,000.00	Gustav E. Rausch	840.00
F. J. P. Cleary	1,000.00	Jas. F. Collins	840.00
C. E. Bracey	1,000.00	L. M. Cleveland	837.01
E. L. Clarke	1,000.00	C. P. Fletcher	832.40
C. Waldren	1,000.00	Louisa Tayler	821.19
A. M. Wright	1,000.00	Jas. S. Burkley	817.90
A. H. Love	1,000.00	Marion Dorset	800.00
F. C. Cooney	1,000.00	Annie L. Pierce	798.90
Edgar Brown	1,000.00	Ralph Hosmer	798.90
A. H. Howell	1,000.00	Danl. J. Herndon	796.70
Bertha Heiges	1,000.00	Mary A. Dolan	788.76
S. E. Miller	1,000.00	Geo. M. Ruffin	777.60
M. N. Barnard	1,000.00	W. E. Cotton	746.30
B. G. Wasdon	1,000.00	Harry Crompton	720.00
Mary E. Fagan	1,000.00	Thos. Rutledge	720.00
M. C. Montgomery	1,000.00	A. J. Hodges	720.00
B. C. Oberly	1,000.00	Clarence Bean	720.00
Henry Wincklemann	1,000.00	W. H. Johnson	720.00
Janette Stewart	1,000.00	L. D. Frost	720.00
Nathl. Shattswell	1,000.00	B. T. Ridgeway	720.00
Mattie H. Chapman	1,000.00	M. F. Ryon	720.00
S. P. Mennick	1,000.00	W. H. Moore	720.00
Genevra B. Diehl	1,000.00	H. S. Mott	720.00
C. E. Hesse	1,000.00	R. H. Cooke	720.00
Herman Volker	1,000.00	Thad. Fairfax	720.00
Frank D. Emery	1,000.00	Alfred Hawkins	720.00
A. T. Burrows	1,000.00	Jno. Nicholas	720.00
Ralph B. Marean	1,000.00	Frank P. Evans	720.00
A. H. Thiessen	1,000.00	J. S. Lee	720.00
Harry B. Wren	1,000.00	Geo. Hall	720.00
J. B. Monroe	1,000.00	W. P. Steadman	720.00
Hiram Johnson	1,000.00	C. C. Crogan	720.00
F. A. Claveloux	1,000.00	A. H. Kite	720.00
Isaac M. Dolph	1,000.00	W. C. Shimoneck	720.00
C. H. Pelcher	1,000.00	Mose Smith	720.00
B. B. Blankman	987.77	Virginia Peticolas	720.00
Jos. B. Wilson	986.41	Jno. M. Groff	720.00
W. W. Parker	964.61	Michael Hayes	720.00
J. A. Wilson	952.95	Saml. L. Howard	720.00
L. J. Smith	948.90	Chas. W. Chambers	720.00
Alex Ashley	936.26	Frank M. Angelo	720.00
E. G. Johnson	935.80	R. H. Morton	720.00
M. A. Goodchild	926.88	Matt. Mahany	720.00
Guy N. Collins	917.60	David Keller	720.00
Saml. L. Mosby	917.60	E. A. Branham	720.00
Chas. F. Talman	908.20	M. S. Bowie	711.68
Thos. Biggles	900.00	E. D. Merrill	700.00
H. C. Oberholser	900.00	Max West	695.63
Emily E. McDonell	900.00	H. A. Christman	693.60
Edna M. Frost	900.00	L. T. Harrison	680.87
W. P. Cutter	900.00	Tooie A. Geddes	668.50
Alice T. Herens	900.00	Ch. Mohr	668.10
Bell Gaston	900.00	S. D. Judd	663.90
Richard Breaden	900.00	Lina B. Goetz	660.00
W. F. Tastet	888.63	Geo. W. Sheerer	660.00
Marjorie F. Warner	866.20	W. K. Durnbaugh	660.00
Thos. A. Williams	856.01	W. Plummer	660.00
Laura F. Hawkins	845.08	W. O. Harvey	660.00
Flora W. Patterson	840.03	Horace F. Lyon	660.00
Lawrence Gallagher	840.00	Jno. A. Balster	660.00
Jas. Williams	840.00	Wm. Emerson	641.54
Wm. Collier	840.00	J. M. Boardman	635.44
A. H. Brooks	840.00	Mary A. Nelson	630.00
J. A. Mason	840.00	A. J. Newmeyer	613.98
W. A. Murray	840.00	W. F. Deakins	600.00
Annie Parker	840.00	J. K. S. Tabler	600.00
S. E. Jenkins	840.00	H. P. Hottenstein	600.00
Sara Skinner	840.00	Frank Sprague	600.00
A. L. Berry	840.00	Wm. Talbot	600.00
Sally G. Adams	840.00	Myron Baker	600.00
R. F. Johnson	840.00	Edw. McDermot	600.00
Thos. B. Reamy	840.00	R. S. N. Sartz	600.00
A. C. Crain	840.00	Robt. W. Williams	600.00
W. R. Brandenburg	840.00	Plato T. Lee	600.00
F. R. Fravel	840.00	R. E. Rozzelle	600.00
Mary Long	840.00	Jesse Jones	596.67
E. H. Halbach	840.00	Fred Rice	587.40

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

SALARIES—Continued.

Name.	Amount.	Name.	Amount.
A. H. Hitchcock	$585.00	Carrie Myers	$189.26
T. A. Scott	584.20	F. L. J. Boettcher	188.28
W. E. Griffith	543.63	Chas. Holmes	184.61
Celia Gillety	540.00	Amand Lomax	180.00
W. R. Beattie	525.00	Edw. Bailey	178.28
H. E. Brown	520.78	J. A. Murphy	167.60
Wm. Saunders	495.93	Middleton Smith	167.60
Emily Warner	480.00	H. S. Graves	151.60
Martha Boss	480.00	Wm. McLane	151.25
Susie Morgan	480.00	Jno. Roberts	140.80
M. E. Skinner	456.56	J. T. Watlington	135.83
Harry W. Madell	450.00	Kate McCarthy	135.33
L. E. Tait	450.00	Henry Farquhar	134.80
Danl. J. Brown	450.00	O. W. Wyatt	129.20
Frank Mathews	447.55	Wm. Mozee	122.00
Geo. S. Waldo	445.01	E. N. Holledge	121.20
V. H. Olmsted	417.05	Sarah L. Garner	117.97
W. A. Sherman	416.60	J. J. Schutte	115.40
V. P. Bradford	416.10	Jas. B. Adams	115.40
L. H. Fisher	406.27	E. V. Wilcox	114.20
B. B. Bagby	360.00	C. R. Linfoot	111.37
W. A. Orton	353.33	Juliet King	105.04
C. R. Barnett	350.00	J. J. Games	103.82
Anna C. Kelton	348.91	Estelle O'Rouke	101.30
Flora Steineger	336.10	G. M. Ruffin	82.40
Ernest T. Giers	336.10	Ottis H. Yates	82.40
Irvin Frickey	329.35	Jacob Adams	79.17
J. C. I. Evans	329.35	E. D. Gould	73.55
Jessie A. Murphy	315.00	Jno. C. Welsh	69.20
Claude Dobbins	312.63	J. Wm. Fink	57.69
Jno. Sullivan	311.35	E. G. Johnson	57.07
Abbie R. Knapp	307.97	Ella Woolard	50.00
Gertrude E. Upton	296.30	Jno. E. Clements	40.00
Louis S. Caswell	279.05	B. M. Noone	38.92
Delia Wilcox	254.45	Maggie C. Minitor	33.95
S. B. Gregory	251.11	Mary A. Minitor	25.42
Belle O. Saunders	251.10	Sarah I. Proctor	11.51
Lizzie Rollins	240.00	M. E. Rollins	9.23
Belle Meek	240.00	C. H. Norman	6.00
Charity Broadus	240.00	Margaret Phillips	4.62
C. Baltimore	240.00	John Higgins	4.50
C. M. Ridley	240.00	Jno. Howard	4.50
Lucy Payne	240.00	C. A. Norman	3.60
T. H. Kearner, jr	235.80	Albert Woodard	3.00
Clara A. Templeton	235.36	Jno. W. Harris	3.00
Emma S. Thompson	234.60	Geo. Banks	3.00
J. E. Leonard	228.29	Wm. Lewis	1.50
A. J. Olin	213.06	Sandy Higgins	1.50
Geo. W. Brett	212.04	Geo. Johnson	1.50
Mary E. Ryder	210.00		
Jas. Morrison	202.20	Total	472,365.46
Richard Falconer	195.66		

BUREAU OF ANIMAL INDUSTRY—SALARIES AND EXPENSES.

Date.	Name.	Nature of payment.	Total.
1900.			
July 18	S. R. Burch	Traveling expenses	$39.90
19	D. E. Salmon	do	39.75
24	S. R. Burch	do	2.50
25	A. L. Reynolds	Cheese	11.67
	The Chandler & Rudd Co	do	14.40
	Tooie A. Geddes	Traveling expenses	60.40
28	R. A. Pearson	do	21.00
	do	Office expenses	2.50
	W. M. Galt & Co	Cornmeal and bran	203.35
31	Louise Breeden et al	Salaries	2,989.82
Aug. 1	W. G. Orr & Co	Bottles, etc	25.00
	Chas. Lentz & Sons	Supplies	10.05
3	Aquila Mitchell	Services	91.30
6	Jno. S. Buckley	do	101.10
	H. A. Christman	do	101.10
	W. H. Rose et al	Salaries	998.10
	H. A. Hedrick et al	do	478.30
	Julius Huelsen et al	do	611.30
7	Murray J. Myers	Services	101.10
	Peter I. Kershner	do	101.10
	W. D. Jorden	do	101.10
	Chas. A. Brown	do	51.36

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

BUREAU OF ANIMAL INDUSTRY—SALARIES AND EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
1900.			
Aug. 7	M. B. Miller	Services	$101.10
	Arthur M. Rork	do	101.10
	Wm. G. Shaw	do	101.10
	Dan McCunningham	do	101.10
	W. B. Lincoln	do	101.10
	Harry L. McDonald	do	75.80
	Geo. S. Hickox	do	84.20
	W. E. Hill	do	101.10
	Howard M. Burgess	do	101.10
	Leslie J. Allen	do	117.90
	Thos. Castor	do	101.10
	C. H. Stevens	do	117.90
	R. J. Blanche	do	101.10
	Thos. A. Bray	do	117.90
	Harry D. Paxson	do	101.10
	H. D. Mayne	do	101.10
	S. E. Bennett et al	Salaries	5,741.80
	J. J. Brougham et al	do	2,213.33
	Jno. McBirney et al	do	1,653.00
	W. S. Cass et al	do	1,175.93
	L. R. Baker et al	do	847.00
	Fredk. Braginton et al	do	178.50
	Albert Dean et al	do	657.10
	Jas. S. Kelly et al	do	271.48
	T. J. Turner et al	do	456.50
	Joshua Miller et al	do	254.30
	Geo. Ditewig et al	do	269.50
	E. P. Schaffter et al	do	549.78
	A. J. Payne et al	do	806.70
	R. W. Hickman et al	do	2,673.27
	C. H. Zink et al	do	1,702.90
	Jas. Johnston et al	do	1,364.40
	Edw. P. Dowd et al	do	178.50
	C. A. Schaufler et al	do	920.70
	F. W. Huntington et al	do	153.10
	A. G. G. Richardson et al	do	820.30
	W. J. Murphy et al	do	178.50
	E. L. Volgenau et al	do	178.50
	F. W. Ainsworth et al	do	313.90
8	O. E. Dyson et al	do	8,461.91
	E. W. Barthold et al	do	1,937.35
	B. S. Paddock et al	do	299.50
	Ira K. Atherton	Services	117.90
	A. B. Morse	do	117.90
	W. H. Gibbs	do	101.10
	O. W. Snyder	do	117.90
	Robt. H. Treacy	do	101.10
	Jas. Irwin	do	84.20
	Theodore Kanter	do	36.68
	Benj. Howes	do	101.10
	Chas Cowie	do	35.00
	C. L. Morin	do	25.00
9	Morris Wooden et al	Salaries	5,946.84
	Don C. Ayer et al	do	4,607.21
	Jno. Forbes et al	do	2,216.16
	Niels C. Sorensen et al	do	1,893.10
	Rich. W. Tuck et al	do	707.03
	W. C. Barth et al	do	193.70
	Wm. Thompson et al	do	1,003.17
	Frank G. Ketchum et al	do	852.43
	O. B. Hess et al	do	217.18
	A. R. Wake et al	do	515.41
	A. E. Behnke et al	do	1,078.20
	Walter J. Stewart et al	do	689.40
	George S. Baker et al	do	347.00
	Saml. E. Cosford et al	do	178.50
	T. A. Shipley et al	do	330.10
	E. N. Hutchinson et al	do	372.20
	E. T. Davison et al	do	178.50
	L. Enos Day et al	do	170.38
	Frank T. Shannon et al	do	193.70
	George C. Faville et al	do	279.60
	Louis K. Green et al	do	178.50
	Ada K. Gannon	Services	13.04
10	A. G. G. Richardson	Use of horse and buggy	38.00
	A. F. MacLaren	Cheese	16.80
	H. F. Miller & Sons	Tin cans	11.50
	A. F. Martins	Supplies	125.00
11	Charles Keane et al	Salaries	382.58
	A. J. Pistor	Services	101.10
	D. Cumming	do	35.00
	G. W. Ward	do	70.00

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

BUREAU OF ANIMAL INDUSTRY—SALARIES AND EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
1900.			
Aug. 11	F. L. Russell	Services	$32.00
	John A. Bell	do	32.00
	Julius Huelsen	Office expenses	5.40
	E. C. Schroeder	do	5.75
	L. Enos Day	Office expenses	.85
	C. W. Stevens	Traveling expenses	44.92
	Schwarzchild & Sulzberger Co	Freight	11.43
	J. R. Miller	Butter	3.57
	A. E. Behnke	Use of horse and buggy	35.00
	Jas. Vincent	Calf	25.00
	Orrin W. Snyder	Keeping horse	20.00
	J. P. Burrows	Hog cholera mixture, etc	8.01
	George Bower	Mare	60.00
	A. Bauman, jr	Use of horse and buggy	20.00
14	W. B. Moses & Sons	Chair cushion	5.00
	M. Du Perow	Electric fans	64.50
	Geo. E. Howard & Co	Blackleg envelopes	36.00
	Robert Castleberg	Eyeglass cords	2.25
	Edw. S. Schmidt	Prepared feed	6.00
	Mackall Bros	Supplies	34.25
	E. Morrison Paper Co	Envelopes	6.00
	do	Binders' board	1.25
	Z. D. Gilman	Tar, etc	30.00
	do	Thermometers	18.00
16	Henry B. Armsby et al	Salaries	250.30
	F. M. Hunter	Services	84.20
	W. H. Wray	do	387.50
	J. F. Ryder	do	168.50
	L. P. Beechy	do	101.10
	do	Traveling expenses	85.75
	J. A. Brown	do	14.00
	W. E. Hill	do	3.25
	Peter I. Kershner	do	13.05
	R. J. Blanche	do	5.00
	M. B. Miller	do	6.50
	Howard M. Burgess	do	1.25
	Jas. Kunes	do	8.00
	W. C. Honan	do	19.20
	Robt. H. Treacy	do	64.83
	Arthur C. Hart	do	4.40
	J. F. Ryder	do	45.00
	W. H. Wray	do	17.95
	do	Office expenses	3.13
	Chas. M. Day	do	9.00
	W. S. Cass	do	2.00
	A. R. Wake	do	4.92
17	Arthur M. Rork	Traveling expenses	21.25
	Thos. Castor	do	29.70
	McP. Reynolds	do	47.60
18	E. N. Hutchinson	Office expenses	21.00
	W. B. Niles	Traveling expenses	61.95
	Abram M. Adams	do	60.10
	Chas. M. Day	do	100.15
	Lowell Clarke	do	88.20
	L. J. Allen	do	27.65
	Thos. A. Bray	do	34.30
20	Page County Bank	Office rent	8.33
	Chas. O. Brockway	Duplicate tags	16.80
	Lagrange Creamery Co	Butter	15.45
	C. E. Udell & Co	Cheese	24.64
	Iowa Telephone Co	Telephone services	2.50
	The Harrington & King Perforating Co	Supplies	8.63
21	F. W. Hopkins	Services	117.90
	Rice P. Heddom	do	117.90
	F. T. Dolan	do	101.10
	W. P. Ellenberger	do	101.10
	Jos. M. Turner	do	75.80
	Walter M. Foster	do	60.60
	Harry B. Adair	Traveling expenses	27.00
	Jno. E. Munn	do	14.80
	Wm. D. Jorden	do	101.52
	Geo. S. Hickox	do	108.75
	F. Kral	Bacterial cultures	10.75
	The Schovill & Adams Co. of New York	Zeiss lens	50.00
	Joe Mathy	Iron pipe	64.00
	St. Louis National Stock Yards Co	Office rent	50.00
	W. S. Cass	Horse feed	10.00
	L. Berger	Hauling	2.70
	Bark River Cheese Co	Butter	6.16
	Foster's Creamery Co	do	5.37
	D. Frank Parker	Typewriter paper, etc	49.00
	Wm. Lochte	Shoeing horses, etc	9.82

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

BUREAU OF ANIMAL INDUSTRY—SALARIES AND EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
1900.			
Aug. 21	Washington Gaslight Co	Gas	$26.40
	Hiram W. Hawley	Use of horse and wagon	37.50
	do	Use of horse and buggy	23.00
	A. P. Little	Stencil paper, etc	4.45
	Stock Yard Paint Co	Tacks, rubber tubing, etc	3.55
	S. W. Burt	Use of saddle horse	15.00
	United States Electric Lighting Co	Electric current	1.89
	do	do	18.82
22	Jno. A. Bell	Traveling expenses	4.62
	Chas. Cowie	do	4.50
	Jno. McBirney	do	74.47
	G. W. Ward	do	9.25
	F. M. Perry	do	27.65
	F. L. Russell	do	15.75
	B. Howes	do	17.25
	C. L. Morin	do	4.25
	H. D. Mayne	do	6.62
	W. H. Rose	Office expenses	22.15
	A. G. G. Richardson	do	6.85
	Marion Dorset	do	33.92
23	O. E. Dyson	do	13.93
	Hugo Eilbring	Traveling expenses	13.40
	Chas. Keane	Use of horse and buggy	25.00
	Don C. Ayer	do	15.00
25	R. P. Clarke Co	Feather dusters	24.00
	Richd. L. Lamb	Pads	6.75
	O. E. Dyson	Use of horse	15.00
29	Goes Lithographing Co	Meat inspection stamps	801.78
	Dan. McCunningham	Traveling expenses	63.65
	Harry D. Paxson	do	57.65
	Rice P. Steddom	do	99.79
	W. P. Ellenberger	do	96.40
	F. W. Hopkins	do	13.95
	S. E. Bennett	do	16.05
	do	Use of horse	23.00
	Wm. C. Siegmund	Traveling expenses	32.30
	Jas. W. Davis	Use of horse and buggy	18.00
	Leo Baum	Illustrated bulletin	1.25
	Thos. Somerville & Sons	Drying bath, etc	51.48
	Jno. C. Parker	Letter books, etc	83.71
31	Louise Breedin et al	Salaries	3,143.81
Sept. 4	Jno. S. Buckley	Services	101.10
	H. A. Christmann	do	101.10
	Harry B. Adair	do	117.90
	R. A. Ramsay	Traveling expenses	45.25
	Fredk. T. Dolan	do	52.50
	Jno. H. McNeall	do	67.00
	Geo. S. Baker	do	6.10
5	H. A. Hedrick et al	Salaries	478.30
	W. H. Rose et al	do	1,000.60
	Julius Huelsen et al	do	611.30
	L. S. Depue	Oats	6.60
	J. T. Walker Sons	Lime	7.50
	The J. C. Ergood Co	Soap	10.25
	W. M. Galt & Co	Oats, corn, and wheat	436.50
	Wyckoff, Seamans & Benedict	Adjusting typewriter	13.75
6	Alfred H. Hollidge	Services	21.00
7	Benj. Sharpless	Butter box	1.25
	Eberhard Faber	Bands	64.80
	do	do	4.00
	Bausch & Lomb Optical Co	Supplies	361.45
	A. H. Reid	Bolts, staples, etc	1.67
	Phillip Lindemyr	Ink for stamp pads	1.92
	E. J. Brooks & Co	Compressor glasses	74.00
	F. M. Perry	Services	117.90
	Carle E. Burgdorf	Use of horse and buggy	60.00
	Monroe B. Miller	Services	101.10
	Geo. S. Hickox	do	84.20
	R. H. Treacy	do	101.10
	Arthur M. Rork	do	101.10
	Murray J. Myers	do	101.10
	A. J. Pistor	do	101.10
	W. E. Hill	do	101.10
	Geo. C. Moser	do	101.10
	Willis B. Lincoln	do	101.10
	H. D. Mayne	do	101.10
	B. Howes	do	101.10
	Harry D. Paxson	do	101.10
	Walter E. Howe	do	101.10
	Thos. Castor	do	101.10
	R. J. Blanche	do	101.10
	Thos. J. Bray	do	117.90

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

BUREAU OF ANIMAL INDUSTRY—SALARIES AND EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
1900.			
Sept. 7	Leslie J. Allen	Services	$117.90
	Dan. McCunningham	do	101.10
	C. L. Morin	do	30.00
	Chas. A. Brown	do	75.80
	Harry L. McDonald	do	75.80
	Wm. G. Shaw	do	101.10
	Levi P. Beachy	do	101.10
	Wm. D. Jorden	do	101.10
	Howard M. Burgess	do	101.10
	Wilber J. Murphy et al	Salaries	178.50
	Ernest L. Volgenau et al	do	178.50
	W. H. Gibbs	Services	101.10
	Edwin T. Davison et al	Salaries	176.60
	Fredk. Braginton et al	do	178.50
	F. H. Huntington et al	do	155.10
	O. B. Hess et al	do	178.50
	Peter I. Kershner	Services	101.10
	Hardee Wyatt	do	16.63
	Chas. H. Stevens	do	117.90
	Jos. W. Parker	do	71.74
	Jas. Johnson et al	Salaries	1,436.93
	L. A. Robinson et al	do	943.37
8	L. R. Baker et al	do	862.20
	A. J. Payne et al	do	795.32
	Walter J. Stewart et al	do	850.82
	A. G. G. Richardson et al	do	805.10
	E. P. Schaffter et al	do	549.78
	Thos. J. Turner et al	do	456.50
	Albert Deam et al	do	395.38
	T. A. Shipley et al	do	330.10
	Jas. S. Kelly et al	do	279.60
	Joshua Miller et al	do	254.30
	Geo. C. Faville et al	do	279.60
	Louis K. Green et al	do	178.50
	Saml. E. Cosford et al	do	178.50
	E. P. Dowd et al	do	178.50
	L. Enos Day et al	do	178.50
	W. C. Barth et al	do	193.70
	W. S. Cass et al	do	1,084.62
	A. E. Behnke et al	do	1,070.88
	Wm. Thompson et al	do	1,088.70
10	R. W. Hickman et al	do	2,617.60
	C. H. Zink et al	do	789.18
	C. A. Schaufler et al	do	914.60
	Jno. Forbes et al	do	2,360.43
	Jno. McBirney et al	do	1,681.00
	Frank D. Ketchum et al	do	816.56
	Genevieve Petrie	Services	14.67
	Richd. W. Tuck et al	Salaries	704.16
	H. N. Waller et al	do	359.77
	Geo. Ditewig et al	do	269.50
	Ira K. Atherton et al	do	176.60
	F. M. Perry	Services	117.90
	Arthur B. Morse	do	117.90
	Orrin W. Snyder	do	117.90
12	Morris Wooden et al	Salaries	5,956.92
	O. E. Dyson et al	do	8,574.48
	United States Electric Lighting Co	Electric current	26.83
	Rudolph, West & Co	Supplies	133.23
	do	Rawhide, etc	7.60
	do	Cartridges	1.35
	J. T. Thompson	Stamping letter heads	21.60
	Edwd. S. Schmid	Guinea pigs	300.00
13	Jas. Irwin et al	Salaries	84.20
	W. C. Siegmund	Services	101.10
	J. J. Brougham et al	Salaries	2,107.65
	Don. C. Ayer et al	do	4,514.34
	Benj. S. Paddock et al	do	292.97
	Frank T. Shannon et al	do	193.70
	Walter E. Howe	Services	101.10
	W. S. Devoe	do	210.60
	do	do	210.60
	Chas. Keane et al	Salaries	390.70
	Geo. S. Baker et al	do	422.80
	E. N. Hutchinson et al	do	340.20
	A. R. Wake et al	do	527.10
	C. B. Jones	Traveling expenses	15.85
14	S. E. Bennett et al	Salaries	5,783.99
15	N. C. Sorensen et al	do	1,887.26
	E. W. Barthold et al	do	1,937.30

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

BUREAU OF ANIMAL INDUSTRY—SALARIES AND EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
1900.			
Sept. 17	Wm. E. Pratt	Hog rings	$180.60
	Goes Lithographing Co	Meat inspection stamps	684.83
	do	do	32.00
	F. M. Hunter	Services	84.20
	W. M. Foster	Traveling expenses	19.45
	do	Services	60.60
	W. P. Ellenberger	do	101.10
	F. P. Dolan	do	101.10
	F. W. Hopkins	do	117.90
	R. P. Steddom	do	117.90
	Jos. M. Turner	do	9.78
	Henry P. Armsby et al	Salaries	250.30
	J. F. Ryder	Services	168.50
	do	Traveling expenses	45.00
	W. H. Wray	Services	387.50
	do	Traveling expenses	19.37
	do	Office expenses	3.36
	C. T. Kent	Calf	25.00
	H. F. Miller & Son	Tin cans	17.25
	Geo. E. Howard & Co	Envelopes	67.50
	American Ice Co	Ice	25.68
	do	do	27.07
	W. M. Galt & Co	Feed	203.35
	Washington Gas Light Co	Gas	21.10
	Chas. R. Edmonston	Pans, etc	33.30
	Jas. B. Lambie	Belting, etc	33.01
	C. W. Stiles	Office expenses	16.10
	Marion Dorset	do	19.59
18	W. B. Niles	Traveling expenses	49.00
	Levi P. Beechy	do	99.80
	Geo. S. Baker	do	5.50
	J. Otis Jacobs	do	43.40
	do	do	16.55
	F. C. Eells	do	23.35
	C. H. Bugbee	do	16.00
	Wm. C. Honan	do	21.60
	Belle Ritter	Services	13.86
	U. G. Houck	Traveling expenses	26.00
	Jno. McBirney	do	85.12
	J. H. McNeall	Services	101.10
	do	do	101.10
	do	Traveling expenses	57.85
	Henry C. Babcock	do	4.75
	Harry B. Adair	Services	117.90
	D. Cumming	do	105.00
	Robt. H. Treacy	Traveling expenses	89.50
	Chas. M. Day	do	70.52
	Abram M. Adams	do	68.35
	W. E. Hill	do	3.00
	M. B. Miller	do	11.10
	Harry D. Paxson	do	18.75
	Chas. A. Brown	do	13.45
	George C. Moser	do	24.60
	Murray J. Myers	do	48.45
	do	do	52.60
	Wm. G. Shaw	do	46.05
	Dan. McCunningham	do	61.83
	C. L. Morin	do	6.15
	H. D. Mayne	do	3.02
	F. L. Russell	do	36.05
	do	Services	80.00
	Geo. W. Ward	Traveling expenses	13.00
	do	Services	65.00
	Jno. A. Bell	do	8.00
	H. T. Potter	do	3.00
	Chas. Cowie	do	65.00
	F. M. Perry	Traveling expenses	23.15
	A. F. Martins	do	17.65
19	David Pifferling	Horse	35.00
	Wm. Lochte	Shoeing horses	7.00
	E. B. Markham	Hogs	93.00
	Edw. S. Schmid	Prepared feed	36.00
	J. A. Cooper	Use horse and buggy	8.00
	F. T. Dolan	Traveling expenses	32.95
	Rice P. Steddom	do	94.94
	Geo. S. Hickox	do	163.05
	Thos. Castor	do	52.00
	W. D. Jorden	do	77.42
	A. M. Rork	do	74.74
	L. J. Allen	do	58.65

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

BUREAU OF ANIMAL INDUSTRY—SALARIES AND EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
1900.			
Sept. 19	Don. C. Ayer	Use horse	$15.00
	Jas. W. Davis	Use horse and buggy	18.00
	J. P. Burrows	Hog-cholera mixture	45.88
	Iowa Telephone Co	Rent telephone	2.50
	O. W. Snyder	Use horse	20.00
	Saml. E. Bennett	do	23.00
	Chas. Keane	Use horse and buggy	25.00
	S. W. Burt	do	15.00
	W. L. Harmon	Furnishing, etc., electric buzzer	3.00
	Rand, McNally & Co	Ink	8.00
	H. W. Hawley	Use horse and buggy	23.00
	do	Use horse and wagon	40.50
	A. P. Little	Ink, blotters, etc	2.40
	O. E. Dyson	Use saddle horse	15.00
	American Sheep Breeder	One electro	2.40
21	Southern Rwy. Co	Passenger transportation	8.00
	Pacific Express Co	Express charges	3.30
	Sam. E. Cosford	Horse and buggy	14.19
	A. Bauman, jr	do	20.00
	Chicago Car Seal and Manufacturing Co	Tags, etc	29.10
	St. Louis National Stock Yards	Office rent	50.00
	Page County Bank	do	8.33
	Gatchell & Manning	Plates, goats	15.35
	A. E. Behnke	Use horse and buggy	35.00
	A. G. G. Richardson	do	38.00
	H. F. Miller & Son	Tin can	11.50
22	Atlanta, Knoxville and Northern Rwy. Co	Passenger transportation	9.30
	E. C. Schroeder	Office expenses	7.40
	A. G. G. Richardson	do	6.28
	W. P. Ellenberg	Traveling expenses	89.04
	Julius Huelsen	Office expenses	5.60
	W. H. Rose	do	24.70
	Geo. S. Baker	do	.50
	Chas. M. Day	do	11.21
	W. S. Cass	Horse feed	10.00
	do	Labor	2.00
	A. R. Wake	Office expenses	4.92
	Lowell Clarke	Traveling expenses	98.00
	E. P. Schaffter	do	2.50
	do	Office expenses	1.25
	D. E. Salmon	Traveling expenses	54.75
24	W. E. Siegmund	do	79.44
	Harry B. Adair	do	56.25
	Schwarzschild & Sulzberger Co	Freight expenses	2.54
	Bausch & Lomb Optical Co	Camel's-hair brushes	.75
30	Louise Breeden et al	Salaries	2,973.17
	Total first quarter		148,706.17
Oct. 1	Jno. H. McNeall	Services	58.70
	do	Traveling expenses	31.50
	C. W. Stiles	do	125.18
	R. Carter Ballantyne	Tags, wax	7.25
	Leo Baum	Photograph for bulletin	1.50
2	M. V. Thompson	Pigs, feed, etc	145.00
	C. T. Kent	Calves	66.00
	J. W. Nunamaker	Clocks, rent of	.42
	Hugh M. Rowe	Traveling expenses	92.35
	W. E. Howe	do	76.30
	R. A. Ramsay	do	52.12
4	Chas. A. Brown	Services	73.40
	H. L. McDonald	do	73.40
	Dan. McCunningham	do	97.80
	Wm. G. Shaw	do	97.80
	Louis Metsker	do	97.80
	Thos. Castor	do	97.80
	A. M. Rork	do	97.80
	Raymond Johnson	do	97.80
	W. D. Jorden	do	97.80
	M. B. Miller	do	97.80
	R. J. Blanche	do	97.80
	H. M. Burgess	do	97.80
	M. J. Myer	do	97.80
	W. E. Hill	do	97.80
	L. J. Allen	do	97.80
	Harry D. Paxson	do	114.20
	P. I. Kershner	do	106.52
	H. D. Mayne	do	106.52
	Whitall Tatum & Co	Supplies	97.80
	Levi P. Beechy	Services	7.50
			97.80

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

BUREAU OF ANIMAL INDUSTRY—SALARIES AND EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
1900.			
Oct. 4	A. J. Pistor	Services	$97.80
	C. A. Schaufler et al	Salaries	841.84
	H. A. Hedrick et al	do	463.40
	W. H. Rose et al	do	966.30
5	Julius Huelsen et al	do	613.92
	Geo. C. Faville et al	do	270.80
	Jas. S. Kelly et al	do	270.80
	W. J. Murphy et al	do	173.00
	F. W. Huntington et al	do	147.80
	Edw. P. Dowd et al	do	173.00
	H. T. Potter	Services	35.00
	F. M. Perry	do	114.20
	Chicago and North Western Rwy. Co	Passenger transportation	42.50
	The Atchison, Topeka and Santa Fe Rwy. Co.	do	30.00
	The Chesapeake and Ohio Rwy. Co	do	30.00
	The Great Northern Rwy. Co	do	15.90
	Union Pacific R. R. Co	do	85.90
	The Chicago, Burlington and Quincy R.R. Co.	do	42.50
	do	do	5.80
	Southern Rwy. Co	do	5.65
	Chicago, St. Paul, Minneapolis and Omaha Rwy. Co.	do	7.90
	Santa Fe Pacific R. R. Co	do	8.65
	do	do	29.65
	The Colorado Southern Rwy. Co.	do	8.45
6	E. L. Volgenau et al	Salaries	173.00
	A. G. G. Richardson et al	do	779.80
	R. W. Hickman et al	do	2,462.18
	W. B. Lincoln et al	Services	97.80
	J. Otis Jacobs	do	101.10
	A. B. Morse	do	114.20
	Fredk. Braginton et al	Salaries	173.00
	Ira K. Atherton et al	do	184.64
	W. C. Barth et al	do	187.60
	Joshua Miller et al	do	246.40
	Geo. Ditewig et al	do	261.00
	Thos. J. Turner et al	do	442.00
	A. J. Payne et al	do	781.60
	L. R. Baker et al	do	835.60
	W. S. Cass et al	do	1,043.80
	A. E. Behnke et al	do	1,111.03
8	Jas. Johnston et al	do	1,403.32
	L. A. Robinson et al	do	1,164.30
	Chas. H. Zink et al	do	769.37
	J. J. Brougham et al	do	2,046.36
	Frank D. Ketchume et al	do	818.19
	E. P. Schaffter et al	do	533.60
	Albert Dean et al	do	513.60
	A. R. Wake et al	do	465.53
	Harry W. Waller et al	do	422.03
	Saml. E. Cosford et al	do	173.00
9	S. E. Bennett et al	do	5,430.16
	S. Stewart et al	do	537.20
	L. Enos Day et al	do	173.00
	E. F. Davison et al	do	173.00
	Richd. W. Tuck et al	do	686.73
	W. H. Gibbs	Services	97.80
	D. Cumming	do	85.00
	Chas. H. Stevens	do	114.20
	Orrin W. Snyder	do	114.20
	Geo. S. Hickox	do	81.60
10	Thos. A. Scott	Traveling expenses	40.80
	J. A. Cooper	Use horse and buggy	27.88
	T. A. Shipley et al	Salaries	319.80
	E. N. Hutchinson et al	do	294.63
	Jas. Irwin	Services	81.60
	Louis K. Green et al	Salaries	161.52
	F. W. Hopkins	Services	114.20
	Hugh M. Rowe	do	198.90
	Walter E. Howe	do	97.80
	Thos. A. Bray	do	114.20
	Ada K. Gannon	do	20.39
	Niels C. Sorensen et al	Salaries	1,742.50
	do	Expenses	12.23
	Jno. Forbes et al	Salaries	2,456.67
	W. J. Stewart et al	do	1,133.18
	Wm. Thompson et al	do	1,138.03
	Don. C. Ayer et al	do	4,471.05

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

BUREAU OF ANIMAL INDUSTRY—SALARIES AND EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
1900.			
Oct. 11	O. E. Dyson	Expenses	$25.40
	O. E. Dyson et al	Salaries	7,487.33
	E. W. Barthold et al	do	1,887.06
	Herman Busman et al	do	825.80
	Jno. McBirney et al	do	1,608.72
	Benj. S. Paddock et al	do	304.60
	Morris Wooden et al	do	5,897.51
12	W. F. Crewe	Services	19.57
	Chas. O. McDonald	do	27.39
	Warren J. Fretz	do	97.80
	O. G. Atherton	do	114.20
	O. B. Hess et al	Salaries	173.00
	Geo. S. Baker et al	do	409.40
	Frank T. Shannon et al	do	187.60
	Chas. Keane et al	do	378.60
	E. B. Jones	Traveling expenses	72.30
	Z. D. Gilman	Filtering tubes, etc	37.60
	Mackall Bros	Carbolic acid, etc	18.52
	P. Mann & Co	Seed rye	3.00
	Rudolph, West & Co	Rubber hose	3.05
	do	Hammer, etc	13.47
	do	Chamois skins	12.00
15	H. P. Armsby et al	Salaries	244.40
	B. Howes	Services	97.80
	C. L. Morin	do	40.00
	Chas. Cowie	do	50.00
	R. P. Steddom	do	114.20
	Fredk. T. Dolan	do	97.80
	W. P. Ellenberg	do	97.80
	Jos. M. Turner	do	56.25
	W. M. Foster	do	58.80
	Bausch & Lomb Optical Co	Fitting lens	1.00
	The Spectator Co	Tate arithmometer	400.00
	Dennison Manufacturing Co	Tags, etc	35.25
	E. J. Brooks & Co	Lead seals	357.75
	D. M. Nesbit	Services	65.00
16	J. Otis Jacobs	do	97.89
	H. B. Adair	do	114.20
	W. C. Siegmund	do	97.80
15	R. H. Treacy	do	97.80
	United States Electric Lighting Co	Electric current	20.73
	do	Conduit and cable	9.20
	A. Wilson & Bro	Hay and straw	1,904.04
	American Ice Co	Ice	22.20
	M. Du Perow	Blade fans	25.80
	Washington Gaslight Co	Gas	22.00
	R. A. Pearson	Traveling expenses	48.00
18	M. S. Lantz	Services	97.80
	E. A. de Schweinitz	Meat, sawdust, etc	26.02
19	Abram M. Adams	Traveling expenses	69.05
	Chas. E. Steel	do	5.20
	Thos. A. Bray	do	18.90
	Dan McCunningham	do	28.97
	Louis Metsker	do	48.45
	Geo. C. Moser	do	44.05
	Peter I. Kershner	do	15.05
	Wm. G. Shaw	do	16.95
	Harvey D. Paxson	do	1.20
	Richd. J. Blanche	do	5.13
	Murray J. Myers	do	10.20
	M. B. Miller	do	11.50
	W. E. Hill	do	1.75
	Frank C. Eells	Services	97.80
	W. S. Devoe	Traveling expenses	81.50
	do	do	56.25
	E. N. Hutchinson	do	2.50
	Geo. S. Baker	do	5.00
	Jno. McBirney	do	74.01
	W. B. Niles	do	60.55
	W. C. Honan	do	19.05
	Jos. M. Turner	do	12.75
	Jos. W. Park	do	5.20
	Danl. S. Hays	do	9.70
	Jno. C. Milnes	do	1.75
	W. J. Fretz	do	18.00
	The Office Toilet Supply Co	Towel service	140.87
	Chicago Telephone Co	Telephone service	43.75
	A. P. Little	Paper	5.00
	S. W. Burt	Horse service	15.00
	O. E. Dyson	do	15.00

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

BUREAU OF ANIMAL INDUSTRY—SALARIES AND EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
1900.			
Oct. 19	Rand, McNally & Co	Ink	$5.00
	Union Stock Yards and Transit Co	Office rent	225.00
	Hiram W. Hawley	Use horse and wagon	37.50
	do	Use horse and buggy	23.00
	Gahn & Byrne	Office rent	675.00
	J. Haberle	Repairing lock boxes	5.00
	do	do	2.50
	Jno. Forbes	Maintenance of horse and buggy	45.00
	Jas. W. Davis	Use of horse and buggy	18.00
	Nebraska Telephone Co	Telephone service	13.50
	Central Union Telephone Co	do	18.00
	Armstrong Laundry	Towel service	4.00
	Armour Packing Co	Telephone service	12.50
	Cutler & Neilson Paint and Color Co	Thinner	2.50
	F. P. Burnap Stationery and Printing Co	Ink	5.00
	Saml. E. Cosford	Use of horse and buggy	20.00
	A. Bauman, jr	do	20.00
	R. C. Kent	Calf	22.00
	Iowa Telephone Co	Telephone service	10.50
	Chas. Keane	Use of horse and buggy	25.00
	Geo. L. McKay	Butter	29.40
	H. J. Evans	do	11.20
	W. A. Carpenter	do	4.60
	J. K. Bennett	do	5.88
	Lewis Ladrach	Cheese	12.72
	Mowbray & Robbins	Butter	2.34
	H. A. Shellenberger	do	3.78
	Goes Lithographing Co	Meat stamps	924.94
	Jay E. Williams	Traveling expenses	3.65
	Chicago Car Seal and Manufacturing Co	Tags	40.20
	do	do	19.70
	J. S. Buckley	Services	97.80
20	Thos. Somerville & Sons	Basin	1.45
	R. Carter Ballantyne	Envelopes, etc	56.47
	The Chesapeake and Potomac Telephone Co	Telephone services	123.75
	Bourbon Stock Yards Co	Rent of office	30.00
	St. Louis National Stock Yards	do	50.00
	Missouri and Kansas Telephone Co	Telephone service	12.50
	W. S. Cass	Horse feed	10.00
	St. Joseph Stock Yards Co	Rent of office	90.00
	Iowa Telephone Co	Telephone service	2.50
	Page County Bank	Rent of office	8.33
	J. P. Burrows	Cholera mixture	57.27
	S. E. Bennett	Use of saddle horse	23.00
	Orrin W. Snyder	Maintenance of horse	20.00
	E. J. Newmeyer	Traveling expenses	37.95
23	C. H. Zink	Express charges	.50
	do	Traveling expenses	7.80
	do	Use of horse and buggy	120.00
	B. H. Adams et al	Office rent	120.00
	R. W. Hickman	Street-car fares	10.05
	Jas. M. Cadman	Office rent	90.00
	Gerald E. Street	Janitor service	24.00
	J. A. Turner Co	Office rent	36.00
	The Schwarzchild & Sulzberger Co	Freight on butter	45.81
	do	Freight on poultry, etc	69.88
	International Office Toilet Supply Co	Towel service	5.58
	East Buffalo Live-Stock Exchange Co	Office rent	90.00
	Merchants' Union Ice Co	Ice	6.08
	New England Telephone and Telegraph Co	Telephone service	12.00
	do	do	40.50
	Bay State Clean Towel Co	Towel service	3.00
	Chesapeake Potomac Telephone Co	Telephone service	19.50
	The Bell Telephone Co., of Philadelphia	do	40.00
	A. E. Behnke	Use of horse and buggy	35.00
	A. G. G. Richardson	Ice, etc	10.73
	do	Use of horse and buggy	38.00
	N. Rufus Gill	Office rent	31.25
	C. A. Schaufler	Use of horse	60.00
	Jas. Stikeman	Office rent	125.00
	Roethlesberger & Gerber	Cheese	14.82
	Armour & Co	Butter	30.00
	Carrie J. Wilson	do	3.64
	Chas. P. Mecabe & Son	do	13.95
	Alvah S. Reynolds	Cheese	17.11
	F. W. Culbertson	Butter	3.00
	Hunter, Walton & Co	do	14.03
	R. P. Steddam	Traveling expenses	68.87
	Cornish, Curtis & Greene Mfg. Co	Butter	1.41
	G. W. Tortellott	Office rent	135.00

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

BUREAU OF ANIMAL INDUSTRY—SALARIES AND EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
1900.			
Oct. 23	Chas. M. Day	Traveling expenses	$68.25
	W. H. Wray	Services	375.00
	J. F. Ryder	do	163.00
	E. J. Brooks & Co	Meat tags	437.25
	F. M. Perry	Travaling expenses	39.70
25	B. P. Wende	do	4.31
	L. A. Robinson	do	37.25
	C. O. Durfer	do	14.58
	W. N. D. Bird	do	10.00
	A. F. Martins	do	10.07
	Jno. P. O'Leary	do	1.95
	Herman R. Ryder	do	4.85
	Harry M. Ball	do	14.80
	F. L. Russell	do	27.15
	do	Services	64.00
	Jno. A. Bell	do	8.00
	Geo. W. Ward	do	70.00
	Chas. Cowie	Traveling expenses	4.75
	Hervey T. Potter	do	10.25
	B. Howes	do	14.90
	H. D. Mayne	do	6.82
	C. L. Morin	do	4.55
24	Gatchel & Manning	Illustrations	25.40
	do	do	25.25
	Raymond Johnson	Traveling expenses	17.77
	W. C. Barth	Ink, etc	2.05
	Albert E. Behnke	Towel service, etc	26.63
	Wm. Thompson	Ink, etc	8.80
	B. L. Stine	Street-car fares	10.90
	F. W. Ainsworth	Cleaning office, etc	3.75
	Don W. Patton	Ink, etc	2.57
	A. R. Wake	Express charges	1.00
	do	Street-car fare	4.52
	T. A. Shipley	Express charges	10.35
	Jno. Forbes	Ink, etc	2.45
	Joshua Miller	Coal, etc	4.50
	Chas. Keane	Towel service	4.85
	Chas. M. Day	Hay, etc	16.04
	Jas. B. Clancy	Traveling expenses	28.25
	Chas. H. Stevens	do	39.37
	E. N. Hutchinson	Street-car tickets	25.50
	Southern Ry. Co	Passenger transportation	24.47
	Louisville and Nashville R. R. Co	do	9.00
	Northern Pacific Ry. Co	do	29.05
	Pennsylvania Co	do	17.50
	Oregon Short Line R. R. Co	do	34.50
	The Missouri Pacific Ry. Co	do	4.60
23	Nashville, Chattanooga and St. Louis Ry. Co.	do	40.35
24	E. C. Schroeder	Towel service	5.55
25	L. S. Depue	Oats	33.00
	J. T. Thompson	Envelopes	14.40
	A. Wilson & Bro	Salt and cabbage	10.05
	Wm. Lochte	Services	9.85
	J. A. Cooper	Use horse and buggy	48.00
26	H. N. Slater	Butter	4.50
	Wyandotte Gas Co	Gas	.44
	Louis K. Green	Traveling expenses	8.85
	Elwin T. Davison	Office expenses	1.20
	W. S. Cass	do	2.00
	W. S. Devoe	Services	203.80
	do	Traveling expenses	52.00
	Thos. J. Turner	Office expenses	25.70
	Walter E. Howe	Traveling expenses	67.75
	Wm. E. Pratt	Hog rings	19.05
	Chicago Car Seal and Manufacturing Co	Tags	32.40
	J. Wm. Fink	Traveling expenses	10.00
29	Jno. C. Parker	Stationery	129.98
30	Edwd. S. Schmidt	Prepared feed	6.00
	W. M. Galt & Co	Feed for animals	658.35
	M. G. Copeland & Co	Flag	3.45
	Geo. F. Muth & Co	Lamps, lanterns, etc	8.22
	do	Gasoline	.85
	Postal Telegraph Cable Co	Telegraph service	18.91
31	Louise Breeden et al	Salaries	3,027.53
Nov. 1	Jas. B. Archer	Calves	100.00
	Don C. Ayer	Use of horse	15.00
	Jas. J. Brangham	Office expenses	21.40
	Frank C. Eells	Traveling expenses	48.30
	M. S. Lantz	do	12.50

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

BUREAU OF ANIMAL INDUSTRY—SALARIES AND EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
1900.			
Nov. 1	M. S. Lantz	Traveling expenses	$55.80
	W. A. Willard	do	57.66
	W. H. Rose	Office expenses	25.95
	Hiram Jerome	do	4.50
	Eph. Dietrich	do	10.56
	E. J. Brooks & Co	Compresser glasses	74.00
	The Kansas City Stock Yards Co.	Office rent	49.50
	Thos. A. Bray	Saddle horse, etc	72.00
	B. R. Rogers	Traveling expenses	36.50
	E. A. de Schweinitz	do	43.60
	R. A. Pearson	do	93.29
2	United States Envelope Co	Envelopes	30.12
	Eimer & Amend	Papayotin	.40
	United States Envelope Co	Envelopes	56.05
	Yawman and Erbe Manufacturing Co	Indexes	3.60
	J. P. Nawrath	Sponge	1.65
	Phil. Lindemeyr	Ink	9.00
	do	do	2.88
	Western Union Telegraph Co	Telegraph service	.90
	Houghton & Delano	Seed plates	5.31
	E. H. Catlin & Co	Supplies	3.95
3	Jno. S. Buckley	Services	101.10
	J. W. Fink	do	101.10
5	United States Envelope Co	Envelopes	66.50
	Chicago Car Seal and Manufacturing Co	Tags	50.20
	Eastern Shore of Virginia Produce Exchange.	Sweet potatoes	20.00
	B. R. Rogers	Services	101.10
6	Sante Fe Pacific R. R. Co	Passenger transportation	35.95
	The Texas and Pacific Rwy. Co	do	6.40
	Oregon Short Line R. R. Co	do	28.50
	Northern Pacific Rwy. Co	do	4.35
	Nashville, Chattanooga and St. Louis Rwy. Co.	do	5.18
	Harry E. Overstreet	do	1.04
	Vandalia Line	do	.79
	Star Union Line	do	1.47
	Geo. Ditewig et al	Salaries	269.50
	Harry N. Waller et al	do	425.10
	Chas. H. Stevens	Services	117.90
	F. W. Huntington et al	Salaries	155.10
	E. L. Volgenau et al	do	178.50
	H. A. Hedrick et al	do	478.30
	Julius Huelsen et al	do	671.90
	Ewd. P. Dowd et al	do	178.50
	H. D. Mayne	Services	101.10
7	J. W. Roberts	Pigs	55.00
	J. Mantz Engraving Co	Engraving	50.00
	The Consumers Co	Ice	28.50
	Leslie J. Allen	Services	117.90
	Peter I. Kershner	do	117.90
	Harry D. Paxon	do	117.90
	Thos. A. Bray	do	117.90
	W. G. Shaw	do	101.10
6	Murray J. Myers	do	101.10
	W. E. Hill	do	101.10
	Dan McCunningham	do	101.10
	Louis Metsker	do	101.10
	Wm. D. Jorden	do	101.10
	Raymond Johnson	do	101.10
	H. M. Burgess	do	101.10
	R. J. Blanche	do	101.10
	Thos. Castor	do	101.10
	Monroe B. Miller	do	101.10
	Chas. E. Steel	do	101.10
	Chas. A. Brown	do	75.80
	do	Traveling expenses	5.50
	Jay E. Williams	Services	70.80
	Levi P. Beechy	do	101.10
	Hugh M. Rowe	do	101.10
	L. Enos Day et al	Salaries	178.50
	F. M. Perry	Services	117.90
	Rice P. Steddum	do	117.90
	Fredk. T. Dolan	do	44.02
	W. P. Ellenberger	do	101.10
	J. M. Turner	do	75.80
	W. M. Foster	do	60.60
	Fredk. W. Hopkins	do	117.90
	Harry P. Armsby et al	Salaries	250.30
8	Albert E. Behnke et al	do	1,155.70

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

BUREAU OF ANIMAL INDUSTRY—SALARIES AND EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
1900.			
Nov. 8	Albert J. Payne et al	Salaries	$800.88
	Victor A. Norgaard	Traveling expenses	47.70
	E. Burgdorf	Use horse and buggy	25.00
9	Jas. J. Brougham et al	Salaries	2,149.46
	W. S. Cass et al	do	1,172.67
	Albert Dean et al	do	572.80
	Thos. J. Turner et al	do	456.50
	Trojan A. Shipley et al	do	319.11
	Joshua Miller et al	do	254.30
	Ira K. Atherton et al	do	185.40
	Saml. E. Cosford et al	do	178.50
	Louis K. Green et al	do	178.50
	Frank D. Ketchum et al	do	853.80
	Arthur B. Morse	Services	117.90
	Arthur M. Rork	do	101.10
	W. B. Lincoln	do	101.10
	R. H. Treacy	do	101.10
	Geo. S. Hickox	do	84.20
	Laomer West	do	75.80
	H. L. McDonald	do	75.80
	W. G. Shaw	Traveling expenses	40.00
	D. E. Salmon	do	78.48
10	D. M. Nesbit	do	130.66
	do	Services	85.00
	R. W. Hickman	Office expenses	.31
	R. W. Hickman et al	Salaries	2,688.73
	Louis A. Robinson et al	do	1,340.85
	Chas. H. Zink et al	do	811.60
	Geo. C. Faville	Office expenses	7.85
	Geo. C. Faville et al	Salaries	279.60
	W. J. Murphy et al	do	178.50
	Lewis R. Baker et al	do	879.81
	W. C. Barth et al	do	193.70
	Jas. S. Kelly	do	178.50
	Thos. Clarke	Services	100.00
	Julius Huelsen	Office expenses	5.45
12	O. E. Dyson	do	8.65
	O. E. Dyson et al	Salaries	10,941.04
	R. A. Ramsay	Traveling expenses	6.00
	Don C. Ayer et al	Salaries	4,356.64
	Wm. C. Seigmund	Traveling expenses	117.50
	Hugh M. Rowe	do	103.15
	H. A. Hedrick	Office expenses	13.58
	Wm. D. Jorden	Traveling expenses	98.95
	Thos. Castor	do	103.05
	Geo. S. Hickox	do	146.40
	Geo. Carter	do	56.12
	Harry D. Adair	do	55.50
	W. P. Ellenberger	do	79.76
	F. T. Dolan	do	38.93
	Levi P. Beechy	do	91.35
	J. Otis Jacobs	do	56.60
	J. B. Clancy	do	8.80
	G. W. Ward	do	15.00
	O. G. Atherton	do	82.45
	A. R. Wake	do	19.75
	Walter E. Howe	do	91.00
	Lowell Clarke	do	99.00
	Robt. H. Treacy	do	88.65
	Jno. F. Nelson	do	4.35
	O. B. Hess	do	1.15
	L. J. Allen	do	60.05
	T. L. Armstrong	Office expenses	9.30
	A. G. G. Richardson	do	6.42
	Jas. M. Turner	do	4.45
	Lewis R. Baker	do	1.60
	Fredk. Braginton	do	.70
	R. W. Hickman	do	.75
13	Samuel E. Bennett et al	Salaries	5,706.96
	W. H. Rose et al	do	1,000.60
	Jno. Forbes et al	do	2,459.91
14	Belt R. R. and Stock Yards Co	Office rent	30.00
	Dairymen's Union of California	Cheese and butter	42.31
	Harry N. Waller	Office expenses	6.80
	Frank C. Eells	Services	101.10
	Allen A. Holcombe	do	101.10
	D. Cumming	do	100.00
	Bausch & Lomb Optical Co	Fermentation tubes	7.45
	Morris Wooden et al	Salaries	5,942.49
	New York Telephone Co	Services and rent	30.85

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

BUREAU OF ANIMAL INDUSTRY—SALARIES AND EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
1900.			
Nov. 14	New York Telephone Co	Services and rent	$19.65
15	W. H. Wray	Services	387.50
	do	Office expenses	16.48
	do	Traveling expenses	16.34
	J. F. Ryder	Services	168.50
	do	Traveling expenses	45.00
	Jno. F. Deadman	Services	18.00
	A. G. G. Richardson et al	Salaries	805.10
	C. A. Schaufler	Office expenses	36.85
	C. A. Schaufler et al	Salaries	903.34
	Jas. Johnson et al	do	1,451.30
	Geo. S. Baker	Office expenses	.25
	Geo. S. Baker et al	Salaries	422.80
	A. J. Pistor	Services	101.10
	Fredk. Braginton et al	Salaries	178.50
	Frank T. Shannon et al	do	193.70
	R. W. Tuck et al	do	492.12
	Chas. Keane et al	do	390.70
	Ed. P. Schaffter et al	do	563.43
	Arthur R. Wake et al	do	634.83
	William Thompson et al	do	1,336.02
	Walter E. Stewart et al	do	1,268.75
	Jno. McBirney et al	do	1,647.00
	Geo. S. Jones	Services	2.28
16	Maggie Murphy	do	12.23
	W. E. Howe	do	101.10
	Orrin W. Snyder	do	117.90
	O. G. Atherton	do	117.90
	B. Howes	do	101.10
	C. L. Morin	do	36.00
	G. W. Ward	do	75.00
	F. L. Russell	do	96.00
	W. T. Crewe	do	101.10
	W. S. Devoe	do	210.60
	Lowell Clarke	do	117.90
	Jas. Irwin	do	84.20
	Ernst N. Hutchinson et al	Salaries	295.10
	O. B. Hess et al	do	178.50
	Thos. L. Armstrong et al	do	1,650.35
	Elwin T. Davison et al	do	178.50
	Tait Butler et al	do	505.42
17	Church & Stephenson	Lumber	75.00
	do	do	19.91
	Jas. S. Topham	Instrument case	14.40
	Mackall Bros	Chemicals	35.88
	R. G. Merrill	Traveling expenses	3.30
	R. A. Ramsay	do	4.75
	Geo. S. Baker	do	5.20
	Peter I. Kershner	do	2.75
	Geo. W. Butler	do	30.68
	Murray J. Myers	do	21.15
	C. L. Morin	do	5.70
	Raymond Johnson	do	19.65
	Dan McCunningham	do	16.00
	W. C. Honan	do	20.60
	Chas. A. Brown	do	30.55
	Geo. W. Ward	do	16.23
	M. B. Miller	do	11.15
	Chas. Cowie	Services	70.00
	Louis Metsker	Traveling expenses	48.25
	Laomer West	do	9.05
	B. Howes	do	8.25
	Allen A. Holcombe	do	33.68
	Chas. E. Steel	do	49.80
	W. G. Shaw	do	42.90
	H. D. Mayne	do	10.22
20	F. M. Perry	do	30.20
	Thos. Castor	do	56.30
	A. M. Rook	do	54.98
	Geo. C. Moser	do	58.85
	Lowell Clarke	do	99.00
	Rice P. Steddom	do	77.18
	W. P. Ellenberger	do	112.55
	Abram M. Adams	do	63.20
	O. G. Atherton	do	106.75
	N. G. Houck	do	82.43
	Chas. M Day	do	62.50
	W. B. Niles	do	59.65
	Tait Butler	do	12.50

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

BUREAU OF ANIMAL INDUSTRY—SALARIES AND EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
1900.			
Nov. 20	Cora A. Houseman	Traveling expenses	$20.41
	R. P. Clarke Co	Linen toweling	3.13
21	J. A. Cooper	Hire horse and buggy	48.00
	Frank C. Eells	Traveling expenses	50.25
	Robt. H. Treacy	do	77.70
	Levi P. Beechy	do	126.60
	W. D. Jorden	do	81.99
	Lislie J. Allen	do	74.38
22	F. L. Russell	do	39.55
	M. S. Lantz	Services	101.10
	Wm. C. Siegmund	do	101.10
	Axel Kolling	do	82.61
	Marion Williams	Traveling expenses	18.60
	Bernard W. Murphy	do	62.83
	Jno. McBirney	do	82.36
23	Hugh M. Rowe	do	100.60
	Goes Lithographing Co	Meat inspection stamps	952.20
	do	do	32.00
	Chicago Car Seal and Manufacturing Co	Disks	2.00
	The American Press	Clippings	20.00
	United States Envelope Co	Envelopes	82.29
	Ernest Betz	Furnace	137.50
	American Ice Co	Ice	18.98
	Wm. H. Rupp	Twine	3.75
	M. Du Perow	Incandescent lights	16.25
	E. Burgdorf	Use of horse and buggy	25.00
24	Chicago, Indianapolis and Louisville R. R. Co.	Transportation	.56
	Pennsylvania R. R. Co	Passenger transportation	12.25
	do	do	.35
	do	do	.98
	Southern Rwy. Co	do	5.05
	Littlefield, Alvord & Co	Hauling	125.00
	W. M. Galt & Co	Feed for animals	276.35
26	S. R. Burch	Traveling expenses	58.00
	A. D. Melvin	do	111.25
	D. Frank Parker	Stencil paper, etc	4.25
27	E. D. Markram	Hogs	90.00
	Z. D. Gilman	Supplies	11.69
	The Geo. W. Knox Express Co	Transportation	1.25
	R. P. Clarke Co	Sheeting	3.25
	United States Electric Lighting Co	Electric current	15.61
	Hugh Rielly	Glass and glue	6.13
	Harris & Shafer Co	Soldering boxes	1.30
	Washington Gaslight Co	Gas	27.70
	Edw. S. Schmid	Prepared food	6.00
	Ernest Betz	Repairing copper still	20.00
	Rudolph, West & Co	Wheelbarrows, etc	43.30
	Wm. Lochte	Shoeing horses	9.55
	E. C. Schroeder	Office expenses	11.08
	A. Wilson & Bro	Forage	1,848.73
28	Hiram W. Hawley	Horses and wagons	23.00
	S. W. Burt	Saddle horse	15.00
	H. J. Evans	Butter	12.00
	David C. Wilbur	Cupboard	10.00
	Cornish, Curtis & Greene Manufacturing Co.	Butter	1.94
	Albert Dean	Office expenses	7.06
	W. E. Hill	Traveling expenses	2.50
	Don W. Patton	Office expenses	2.00
	do	Use of horse	15.00
	Jas. W. Davis	Use of horse and buggy	18.00
	Hiram W. Hawley	Use of horse and wagon	40.50
	Detroit Stove Works	Stoves	48.50
	A. P. Little	File case, etc	2.70
	Fort Wayne Coal Co	Coal	16.00
	O. E. Dyson	Office expenses	6.32
	Stock Yard Paint Co	Wire cutters, etc	7.13
	O. E. Dyson	Saddle horse	15.00
	Albert J. Payne	Office expenses	7.42
	Walter M. Foster	do	7.95
	Frank Parker	Services	26.09
	J. Otis Jacobs	Traveling expenses	49.55
	Ernest J. Foreman	Office expenses	9.95
	do	do	9.25
	Tait Butler	do	1.70
	do	do	1.30
	W. E. Howe	Traveling expenses	91.60
	Harry B. Adair	do	70.55
	Axel Kolling	do	12.50

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

BUREAU OF ANIMAL INDUSTRY—SALARIES AND EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
1900.			
Nov. 28	Burton R. Rogers	Services	$97.80
	The Wollaeger Manufacturing Co	Desk	26.50
	Tait Butler	Office expenses	2.92
	Albert E. Behnke	Use horse and buggy	35.00
	Jno. McBirney	Office expenses	3.75
	Page County Bank	Office rent	9.15
	J. P. Burrows	Cholera mixture	46.71
	Iowa Telephone Co	Telephone rent	2.50
	Orrin W. Snyder	Keeping horse	20.00
	Saml. E. Cosford	Hire horse and buggy	20.00
	Chas. Keane	do	25.00
	St. Louis National Stock Yards	Office rent	50.00
	A. Bauman	Hire horse and buggy	20.00
	W. S. Cass	Horse feed	10.00
	S. E. Bennett	Saddle-horse hire	23.00
	Silver Laundry and Towel Co	Towel service	6.96
	Chas. H. Stevens	Traveling expenses	39.87
	Wm. E. Mowrer	do	5.98
	Wilton E. Crewe	do	30.40
	Wm. C. Siegmund	do	114.00
30	Jos. Abel et al	Salaries	3,108.53
Dec. 1	Wyckoff, Seamans & Benedict	Repairs to typewriter	132.06
	E. A. de Schweinitz	Office expenses	30.43
	A. D. Melvin	Traveling expenses	13.05
	R. W. Hickman	do	14.05
	do	Office expenses	5.45
3	Montague Cooperative Creamery Co	Butter	36.25
	Chas. Cowie	Traveling expenses	11.84
	W. H. Rose	Office expenses	26.55
	A. G. G. Richardson	Hire horse and buggy	38.00
	do	Office expenses	6.35
	Williams, Brown & Earle	Specimen jars	6.64
	Dennison Manufacturing Co	Meat tags	1.40
	Library bureau	Index cards	21.60
	Bausch & Lomb Optical Co	Supplies	2.07
	do	do	19.72
	Wm. D. Saunders	Butter	4.62
	Jno. A. Bell	Services	16.00
	M. S. Lantz	Traveling expenses	39.20
	W. H. Gibbs	do	3.89
	Frank Parker	do	18.90
	Geo. S. Hickox	do	163.40
	Thos. Somerville & Sons	Supplies for laboratory	17.03
4	Eastern Shore of Virginia Produce Co	Sweet potatoes	20.00
	Jno. S. Buckley	Services	97.80
	J. Wm. Fink	do	97.80
5	Johnson Bros	Fuel	96.21
	R. Carter Ballantyne	Wax, etc	15.05
	New York, New Haven and Hartford R. R. Co.	Passenger transportation	10.75
	Pennsylvania R. R. Co	do	32.95
	Union Pacific R. R. Co	do	29.35
	Southern Rwy. Co	do	22.30
	Cincinnati, New Orleans & Texas Pacific Rwy. Co.	do	4.50
	Louisville and Nashville R. R. Co	do	4.50
6	J. Otis Jacobs	Services	101.10
7	Albert Dean et al	Salaries	513.60
	Jno. McBirney et al	do	1,591.00
	do	Office expenses	11.13
	Albert J. Payne et al	Salaries	777.58
	Fredk. Braginton et al	do	173.00
	L. Enos Day et al	do	173.00
	Geo. Ditewig et al	do	261.00
	Ira K. Atherton et al	do	179.20
	E. P. Schaffter et al	do	478.06
	Thos. J. Turner et al	do	442.00
	W. S. Cass et al	do	1,115.54
	W. C. Barth et al	do	187.60
	F. W. Ainsworth et al	do	257.28
	H. D. Mayne	Services	97.80
	E. P. Dowd et al	Salaries	173.00
	H. A. Hedrick et al	do	463.40
	N. K. Fegley et al	do	173.00
	W. J. Stewart et al	do	1,207.20
	A. E. Behnke et al	do	1,116.12
	Jas. S. Kelly et al	do	178.87
8	Trajan A. Shipley et al	do	319.80
	Joshua Miller et al	do	246.40
	E. T. Davison et al	do	173.00

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

BUREAU OF ANIMAL INDUSTRY—SALARIES AND EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
1900.			
Dec. 8	Willis B. Lincoln et al	Salaries	$156.60
	Jas. J. Brougham et al	do	2,082.71
	Lewis R. Baker et al	do	894.40
	Lewis K. Green et al	do	173.00
	Saml. E. Cosford et al	do	173.00
	Frank D. Ketchum et al	do	776.54
	O. W. Snyder	Services	114.20
	H. L. McDonald	do	73.40
	Chas. A. Brown	do	73.40
	Arthur M. Rork	do	97.80
	Dan. McCunningham	do	97.80
	Chas. E. Steel	do	97.80
	Wm. G. Shaw	do	97.80
	Richd. J. Blanche	do	97.80
	Wm. D. Jorden	do	97.80
	Louis Metsker	do	97.80
	Raymond Johnson	do	97.80
	Howard M. Burgess	do	97.80
	W. E. Hill	do	97.80
	Thos. Castor	do	97.80
	Murray J. Myers	do	97.80
	Monroe B. Miller	do	97.80
	Peter I. Kershner	do	110.33
	Harry D. Paxson	do	114.20
	L. J. Allen	do	114.20
	Thos. A. Bray	do	114.20
	Harry B. Adair	do	114.20
	Wm. J. Zeh	Fuel	162.24
10	Herman Bussman et al	Salaries	897.14
	Edwin Barthold et al	do	2,160.76
	O. E. Dyson et al	do	7,504.71
	F. W. Huntington et al	do	149.80
	Julius Huelsen et al	do	537.00
	do	Office expenses	6.95
	W. A. Rose et al	Salaries	966.30
	Jas. Johnson et al	do	1,411.00
	A. G. G. Richardson et al	do	779.80
	Chas. H. Zink et al	do	788.00
	Geo. C. Faville et al	do	270.80
	W. J. Murphy et al	do	173.00
	Jno. A. Bell	Services	24.00
	E. L. Volgenau	do	114.20
	Chas. A. Schaufler et al	Salaries	799.89
11	Morris Wooden et al	do	5,892.82
	Jas. Irwin	Services	81.60
	J. E. Williams	do	68.40
	D. Cumming	do	110.00
	Arthur B. Morse	do	114.20
	A. J. Pistor	do	97.80
	L. A. Robinson et al	Salaries	1,334.46
	B. Howes	Services	97.80
	C. L. Morin	do	72.00
	R. P. Steddom	do	114.20
	Walter M. Foster	do	58.80
	Fredk. T. Dolan	do	29.35
	Jos. M. Turner	do	73.40
	W. P. Ellenberger	do	97.80
	F. W. Hopkins	do	114.20
	Harry N. Waller et al	Salaries	2,561.82
	Jennie T. Thomson	Envelopes and letter heads	12.16
13	Edwd. Brundige	Services	40.36
	Levi P. Beechy	do	97.80
	W. C. Siegmund	do	97.80
	Axel Kolling	do	97.80
	D. G. Cooper	do	97.80
	Frank C. Eells	do	97.80
	Geo. S. Hickox	do	81.60
	J. Otis Jacobs	do	97.80
	Frank Parker	do	97.80
	M. S. Lantz	do	97.80
	A. A. Holcombe	do	114.20
	W. E. Howe	do	97.80
	R. H. Treacy	do	97.80
	Hugh M. Rowe	do	97.80
	Chas. H. Stevens	do	114.20
	Ernest N. Hutchinson et al	Salaries	285.80
	Geo. S. Baker et al	do	409.40
	Chas. Keane et al	do	378.60
	O. B. Hess et al	do	173.00
	Wm. Thompson et al	do	1,397.17

Expenditures of Department of Agriculture for year ending June 30, 1901.—Cont'd.

BUREAU OF ANIMAL INDUSTRY—SALARIES AND EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
1900.			
Dec. 13	John Forbes et al	Salaries	$2,319.71
	Tait Butler et al	do	498.96
	Don C. Ayer et al	do	4,096.66
	Tooie A. Geddes	Services	163.00
14	Samuel E. Bennett et al	Salaries	5,520.62
	N. C. Sorensen et al	do	1,784.96
	A. R. Wake et al	do	1,138.53
	Richd. W. Tuck et al	do	427.68
	Frank T. Shannon et al	do	187.60
	Wilton F. Crewe	Services	97.80
	Henry P. Armsby et al	Salaries	244.40
	G. W. Ward	Services	55.00
	F. M. Perry	do	60.87
	H. P. Potter	do	13.00
	W. H. Wray	do	375.00
	do	Office expenses	15.17
	do	Traveling expenses	16.38
	J. F. Ryder	Services	163.00
	do	Traveling expenses	45.00
	do	do	30.00
	Caroline Burnaby	Services	40.00
	do	do	21.93
	John C. Parker	Repairing pencil sharpener	1.00
	F. L. Russell	Services	168.00
15	C. M. Day	Office expenses	15.00
17	Mackall Bros	Alcohol, etc	28.58
	do	do	19.62
	Rudolph, West & Co	Wire netting, etc	36.95
	W. B. Moses & Sons	Furniture	143.40
	Edwd. P. Shaffter	Traveling expenses	2.20
	Anna B. Armstrong	do	19.90
	Lowell Clarke	Services	114.20
	Geo. S. Baker	Traveling expenses	5.20
	A. J. Pistor	do	2.50
	R. J. Blanche	do	1.50
	Peter I. Kershner	do	5.00
	W. E. Hill	do	1.25
	Howard M. Burgess	do	2.75
	Monroe B. Miller	do	5.80
	John A. Bell	do	7.12
	E. L. Volgenau	do	17.45
	John A. Kiernan	do	30.90
	Nathan K. Fegley	do	5.50
	Hervey T. Potter	do	5.00
	F. M. Perry	do	6.20
18	Abram M. Adams	do	54.55
	Allen A. Holcombe	do	23.00
	Chas. A. Brown	do	17.45
	Dan. McCunningham	do	18.35
	Leslie J. Allen	do	29.65
	H. D. Mayne	do	5.32
	Chas. Cowie	do	9.65
	C. L. Morin	do	23.25
19	Chas. Cowie	Services	95.00
	G. W. Ward	Traveling expenses	9.80
	Rice P. Steddom	do	110.01
	W. P. Ellenberger	do	85.75
	Fredk. T. Dolan	do	17.58
	Geo. Jobson	do	12.34
	Chas. M. Day	do	59.50
	Levi P. Beechy	do	107.40
	Geo. S. Hickox	do	88.40
	W. C. Siegmund	do	59.65
	Matthias S. Lentz	do	56.92
	Frank C. Eells	do	52.50
	Thos. A. Bray	do	8.25
	Raymond Johnson	do	48.05
	Arthur M. Rork	do	50.40
	Thos. Castor	do	46.45
	Murray J. Myers	do	34.95
	Thos. Redmond	do	9.35
	Jno. McBirney	do	73.27
	R. A. Ramsay	do	5.50
	American Ice Co	Ice	15.00
	A. Wilson & Bro	Wheat straw	165.00
20	Dennison Manufacturing Co	Meat tags	4.20
	E. J. Brooks Co	Compressor glasses	74.00
	Harry N. Waller	Traveling expenses	18.15
	Wm. E. Pratt	Hog rings, etc	20.30
	Chicago Car Seal and Manufacturing Co	Tags	45.95

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

BUREAU OF ANIMAL INDUSTRY—SALARIES AND EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
1900.			
Dec. 20	W. R. Fleming	Traveling expenses	$13.75
	do	do	13.40
	J. Otis Jacobs	do	50.15
21	Martha A. Britton	do	15.21
	O. G. Atherton	do	19.80
	Lowell Clarke	do	63.50
	H. M. Rowe	do	84.00
	Wm. D. Jorden	do	81.65
	Jno. S. Buckley	do	9.95
	do	do	11.61
	Geo. G. Hill	do	69.60
	do	Services	50.00
	Chicago and Northwestern Rwy. Co	Passenger transportation	42.50
	United States Electric Lighting Co	Electric current	16.29
	Washington Gaslight Co	Gas	29.80
26	Jos. W. Wilson	Traveling expenses	28.80
	Chas. Kettler	Butchers' overall coats	8.25
29	Lutz & Co	Brooms	9.00
	Thos. Somerville & Sons	Cement, etc	42.57
	W. M. Galt & Co	Feed for animals	258.35
	Church & Stephenson	Lumber	39.00
	do	do	174.35
	Mackall Bros	Supplies	107.53
	E. A. de Schweinitz	Traveling expenses	3.60
	do	Office expenses	26.77
	Axel Kolling	Traveling expenses	77.25
	Wilton F. Crewe	do	66.95
	W. G. Shaw	do	43.85
	Chas. E. Steel	do	43.80
	Walter E. Howe	do	97.78
	Wm. C. Siegmund	do	119.50
	Robt. H. Treacy	do	58.55
	W. B. Niles	do	55.25
	F. T. Dolan	do	34.75
	Chas. H. Stevens	do	21.95
	Burton R. Rogers	do	27.05
	Jay E. Williams	do	4.15
	Tait Butler	Office expenses	1.32
	do	do	3.72
	Don C. Ayer	do	2.00
	W. S. Cass	do	2.00
	Chas. M. Day	do	3.50
31	F. L. Russell	Traveling expenses	89.80
	Nathan K. Fegley	Office expenses	4.30
	W. H. Rose	do	23.40
	B. Howes	do	2.50
	Harry N. Waller	do	3.65
	Julius Huelsen	do	5.15
	E. E. Schroeder	do	5.55
	Jos. Abel et al	Salaries	3,051.30
	Total second quarter		234,946.70
1901.			
Jan. 2	Baltimore and Ohio R. R. Co	Passenger transportation	67.00
	Pittsburg, Cincinnati, Chicago and St. Louis Rwy. Co.	do	31.75
	Pennsylvania Co	do	17.50
	Kansas City, St. Joseph and Council Bluff R. R. Co.	do	1.90
	do	do	21.45
	The Atchison, Topeka and Santa Fe Rwy. Co.	do	17.00
	The Chesapeake and Ohio Rwy. Co	do	2.50
	White Star Line	do	115.00
	Chicago, Milwaukee and St. Paul Rwy. Co	do	12.75
	Santa Fe Pacific R. R. Co	do	21.35
	The Missouri Pacific Rwy. Co	do	5.80
	Pennsylvania R. R. Co	do	6.50
	Southern Rwy. Co	do	20.00
	do	do	15.75
	do	do	8.90
3	St. Louis National Stock Yards	Office rent	50.00
	W. S. Devoe	Traveling expenses	45.00
	do	Salary	203.80
	do	Traveling expenses	62.49
	Hibbard, Spencer, Bartlett & Co	Clippers	2.00
	Orrin W. Snyder	Keep of horse	20.00
	J. P. Burrows	Hog-cholera mixture	8.97
	Page County Bank	Office rent	10.00

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

BUREAU OF ANIMAL INDUSTRY—SALARIES AND EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
Jan. 3	Wyckoff, Seamans & Benedict	Ink eradicator	$1.20
	Hiram W. Hawley	Horse and buggy	23.00
	do	do	39.00
	A. M. Rothchild & Co	Hamper basket	3.48
	A. P. Little	Office expenses	2.20
	S. W. Burt	Hire of horse	15.00
	A. Bauman, jr	Hire of horse and buggy	20.00
	Jas. W. Davis	do	18.00
	Jas. B. Archer	Calf	12.00
	Jas. Laughlin	do	25.00
	do	Calves	45.00
	Missouri Stock Yard Co	Stove	3.00
	J. Gates & Bros	Desk	24.00
	Chicago Car Seal and Manufacturing Co	Tags, etc	29.95
	Albert Lea Dairy Association	Butter	16.75
	Bausch & Lomb Optical Co	Microscopical supplies	49.64
	J. P. Nawrath	Sponges, etc	7.75
	do	Twine, etc	19.00
	Eberhard Faber	Rubber bands	41.76
	Yawman & Erbe Manufacturing Co	Binding cases	3.60
	Queen & Co., Incorporated	Steel tape	2.50
	E. J. Brooks & Co	Compressor glasses	74.00
	Miller Bros. & Co	Sweet potatoes	12.00
	B. A. Headley	do	47.31
4	Jas. Lambie	Hardware	34.80
	R. P. Clarke & Co	India linen	1.00
	do	Red tape	1.79
	do	Silk handkerchiefs	2.50
	Z. D. Gilman	Chemical supplies	12.32
	M. Du Perow	Desk telephone	17.50
	Wm. Lochte	Horseshoeing	5.50
	Barber & Ross	Pliers	12.75
	Standard Oil Co	Oil	11.44
	East Shore of Virginia Produce Exchange	Sweet potatoes	62.50
	Goes Lithographing Co	Meat-inspection stamps	634.47
	Chas. Keane	Horse and buggy	25.00
	S. E. Bennett	Saddle horse	23.00
	W. S. Cass	Horse feed	10.00
	Sam. E. Cosford	Horse hire	20.00
	Don C. Ayer	do	15.00
	A. E. Behnke	do	35.00
	Eimer & Amend	Chemicals	4.50
	Michigan Central R. R. Co	Transportation	1.62
	do	do	.68
	Cleveland, Cincinnati, Chicago and St. Louis Rwy. Co.	do	.45
	Burlington, Cedar Rapids and Northern Rwy. Co.	do	.82
	Chicago, Indianapolis and Louisville Rwy. Co.	do	1.89
	Vandalia Line	do	.79
	Nashville, Chattanooga and St. Louis Rwy. Co.	do	.37
	Burlington and Missouri R. R. in Nebraska	do	4.37
	Pennsylvania Co	do	.45
7	United States Express Co	do	4.42
	E. N. Hutchinson	Office expenses	31.40
8	F. M. Perry	Services	117.90
	Jno. A. Bell	do	8.00
	H. D. Mayne	do	101.10
	C. L. Morin	do	62.00
	Hervey T. Potter	do	11.00
	E. L. Volgenau	do	117.90
	A. G. G. Richardson et al	Salaries	805.10
	Jno. McBirney et al	do	1,012.10
	Jno. Forbes	do	2,279.29
	W. S. Cass et al	do	1,156.36
	A. E. Behnke et al	do	1,155.70
	L. R. Baker et al	do	922.80
	A. J. Payne et al	do	806.70
	Geo. Ditewig et al	do	269.50
	E. P. Shaffter et al	do	489.18
	Thos. J. Turner et al	do	456.50
	F. W. Ainsworth et al	do	314.70
9	T. A. Shipley et al	do	330.10
	J. Miller et al	do	254.30
	Tait Butler et al	do	565.14
	Frank D. Ketchum et al	do	792.67
	Ira K. Atherton et al	do	180.40
	Willis B. Lincoln et al	do	161.70

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

BUREAU OF ANIMAL INDUSTRY—SALARIES AND EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
Jan. 9	F. Braginton et al	Salaries	$178.50
	W. C. Barth et al	do	193.70
	Jos. S. Kelly et al	do	200.02
	Louis K. Green et al	do	196.50
	Samuel E. Cosford et al	do	178.50
	Elwin T. Davison et al	do	178.50
	L. Enos Day et al	do	178.50
	Niels C. Sorensen et al	do	1,850.60
	Jas. J. Brougham et al	do	2,158.39
	Don C. Ayer et al	do	4,281.97
	J. Wm. Fink	Services	101.10
10	Saml. E. Bennett et al	Salaries	5,884.48
	Albert Dean et al	do	560.83
	Thos. Castor	Services	117.90
	Thos. A. Bray	do	117.90
	H. D. Paxson	do	117.90
	L. J. Allen	do	117.90
	Harry B. Adair	do	117.90
	A. M. Rork	do	101.10
	Wm. D. Jorden	do	101.10
	R. J. Blanche	do	101.10
	Monroe B. Miller	do	101.10
	W. E. Hill	do	101.10
	Murray J. Myers	do	101.10
	W. G. Shaw	do	101.10
	Howard M. Burgess	do	101.10
	Chas. E. Steel	do	101.10
	Raymond Johnson	do	101.10
	Louis Metsker	do	101.10
	Peter I. Kershner	do	76.09
	Dan McCunningham	do	75.00
	Harry L. McDonald	do	75.80
	R. H. Treacy	do	101.10
	D. Cumming	do	80.00
	A. B. Morse	do	117.90
	Frank Parker	do	101.10
	Hugh M. Rowe	do	101.10
	Geo. S. Hickox	do	84.20
	Levi P. Beechy	do	101.10
	W. E. Howe	do	101.10
	M. S. Lantz	do	101.10
	A. A. Holcombe	do	117.90
	Frank C. Eells	do	101.10
11	Morris Wooden et al	Salaries	5,878.02
	E. N. Hutchinson et al	do	295.10
	O. B. Hess et al	do	178.50
	Chas. Keane et al	do	390.70
	Frank T. Shannon et al	do	193.70
	D. Frank Parker	Typewriter ribbons	13.50
	do	Carbon paper	2.50
	Jno. C. Parker	Knives	1.30
12	O. E. Dyson et al	Salaries	7,764.69
	Frank Rimmer	Services	6.52
	Genevieve Petrie	do	13.86
	Walter J. Stewart et al	Salaries	1,394.29
	Caroline M. Hopkins	Traveling expenses	5.10
	Pearl M. Finch	do	15.00
	Geo. S. Baker et al	Salaries	422.82
	David M. Nesbit et al	do	150.00
	Geo. C. Walker	Smokestack	24.00
14	A. R. Wake	Services	3.80
	Wm. Thompson et al	Salaries	1,533.32
	A. R. Wake et al	do	1,205.13
	Wm. Thompson	Office expenses	20.72
	R. W. Tuck et al	Salaries	453.97
	Houghton & Delano	Supplies	6.44
	Church & Stephenson	Lumber	39.00
	Barber & Ross	Sweeping brushes	18.75
	W. H. Butler	Oil	1.00
	M. Du Perow	Telephone receiver	1.35
	Rudolph, West & Co	Scrub brushes	52.37
	Mackall Bros	Alcohol, etc	49.25
	R. W. Hickman	Traveling expenses	20.10
	G. W. Ward	Services	50.00
	B. Howes	do	101.10
	F. L. Russell	do	40.00
	Chas. Cowie	do	75.00
	Herman Busman et al	Salaries	927.90
	Harry M. Ball et al	do	1,356.10
	E. W. Barthold et al	do	2,211.26

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

BUREAU OF ANIMAL INDUSTRY—SALARIES AND EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
Jan. 15	N. K. Fegley et al	Salaries	$178.50
	W. J. Murphy et al	do	178.50
	Edw. P. Dowd et al	do	178.50
	W. H. Rose et al	do	974.67
	Julius Huelsen et al	do	635.01
	H. A. Hedrick et al	do	478.30
	C. A. Schaufler et al	do	829.82
	Jas. Johnston et al	do	1,463.52
	Geo. C. Faville et al	do	279.60
	C. H. Zink et al	do	769.70
	F. W. Huntington et al	do	153.10
	H. N. Waller et al	do	2,638.30
	Tooie A. Geddes	Services	168.50
16	United States Electric Lighting Co	Electric current	16.16
	Washington Gaslight Co	Gas	31.60
	Chas. R. Edmonston	Supplies	2.75
	Z. G. Gilman	Thermometers, etc	38.91
	F. P. May & Co	Mousetrap	1.50
	American Ice Company	Ice	15.91
	W. S. Devoe	Services	210.60
	J. Otis Jacobs	do	101.10
	Lowell Clarke	do	117.90
	Thos. Redmond	do	60.60
	A. J. Pistor	do	101.10
	Chas. H. Stevens	do	117.90
	Jas. Irwin	do	84.20
	O. W. Snyder	do	117.90
	Wilton T. Crewe	do	78.26
	R. P. Steddom	do	117.90
	Fredk. W. Hopkins	do	110.33
	do	Office expenses	1.94
	Walter M. Foster	Services	60.60
	J. M. Turner	do	75.80
	W. P. Ellenberger	do	101.10
	F. T. Dolan	do	101.10
	O. E. Dyson	Saddle horse	15.00
	do	Office expenses	14.40
	Maggie Taylor	Services	3.26
	W. S. Cass	Office expenses	3.55
	Inez J. Christie	Traveling expenses	10.35
	Allen A. Holcombe	do	6.75
	E. J. Foreman	Office expenses	9.60
	do	do	9.25
	Boyd Baldwin	Traveling expenses	5.87
	Jno. T. Nelson	do	18.00
	F. D. Ketchum	do	9.05
	A. B. Morse	do	14.75
	W. C. Siegmund	do	20.75
	Thos. A. Bray	do	24.40
	Chas. E. Steel	do	24.20
	Harry B. Adair	do	7.70
	Peter I. Kershner	do	14.90
	Monroe B. Miller	do	18.95
	W. E. Hill	do	1.00
	Henry P. Armsby	do	250.30
	Geo. S. Baker	do	5.00
	O. S. McChesney	do	27.50
17	Henry E. Alvord	do	562.74
	Jos. M. Good	do	17.25
	W. H. Wray	Services	387.50
	do	Office expenses	52.45
	do	Traveling expenses	14.32
	Caroline Burnaby	Services	40.00
	J. F. Ryder	do	168.50
	do	Traveling expenses	47.67
	Thos. Castor	do	60.55
	Murray J. Myers	do	58.05
	Geo. C. Moser	do	53.41
	Frank Parker	do	49.40
	Hugh M. Rowe	do	100.70
	Geo. S. Hickox	do	114.60
	A. B. Morse	do	33.19
	Lowell Clarke	do	73.25
	W. B. Niles	do	53.80
	W. E. Howe	do	79.12
	Chas. M. Day	do	57.89
	Jno. McBirney	do	58.37
	Wilton F. Crewe	do	13.20
	Rice P. Steddom	do	72.16
	W. P. Ellenberger	do	51.93

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

BUREAU OF ANIMAL INDUSTRY—SALARIES AND EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
Jan. 17	F. T. Dolan	Traveling expenses	$85.35
18	A. G. G. Richardson	Office expenses	6.21
	C. O. Durfee	Traveling expenses	3.96
	H. M. Ball	do	12.05
	W. N. D. Bird	do	8.25
	Bernhard P. Wende	do	.80
	H. R. Ryder	do	6.75
	Jno. P. O'Leary	do	6.35
	C. H. Zink	do	10.31
	H. D. Mayne	do	3.82
	C. L. Morin	do	13.85
	F. L. Russell	do	15.00
	B. Howes	do	6.25
	G. W. Ward	do	6.75
	Chas. Cowie	do	6.40
	H. T. Potter	do	2.25
	F. M. Perry	do	23.20
	David M. Nesbit	do	63.87
	E. A. de Schweinitz	Office expenses	21.88
	Jno. C. Parker	Stationery	61.91
	W. M. Galt & Co	Oats	400.00
	Edw. S. Schmid	Feed	6.00
19	R. P. Clarke Co	Dusters	12.00
	do	Cloth	1.50
	A. L. Webb & Son's, Branch	Alcohol	22.81
	J. Walter Michener	Butter tub	4.50
	A. Cutler & Son	Furniture	30.50
	T. F. McGrew	Services	200.00
	W. H. Wray	Office expenses	11.93
	do	Traveling expenses	17.72
	C. H. Stevens	do	80.90
	Levi P. Beechy	do	84.40
	Wm. D. Jorden	do	71.35
	J. E. Street	Services	24.00
	Louis Metsker	Traveling expenses	72.05
	do	do	82.50
	H. M. Burgess	do	60.50
	L. J. Allen	do	58.30
	Axel Kolling	Services	101.10
	Iowa Telephone Co	Telephone services	2.50
	T. I. Wilson	Pigs	66.00
	J. T. Sullivan	Coal	7.00
	Cutler & Neilson Paint and Color Co	Thinner	3.75
	Joe. W. Timmer	Supplies	5.20
	Frank P. Thien	Iron screen	2.75
	J. Haberle	Supplies	10.10
	A. P. Little	do	5.35
	F. H. Lovell & Co	Clock	.81
	The Bridgewater Hills Creamery Co	Butter	1.80
	C. F. Braisted	Pencils	1.97
21	C. W. Zink	Horse and buggy hire	120.00
	Withall, Tatum & Co	Beakers	14.68
	N. R. Gill	Office rent	31.25
	The Bell Telephone Co., of Buffalo	Telephone rent	12.00
	Bausch & Lomb Optical Co	Flasks, etc	2.49
	J. Stikeman	Office rent	125.00
	Bay State Clean Towel Co	Towel supply	3.00
	Chas. A. Schaufler	Keep of horse	60.00
	Library Bureau	Book dummies	2.50
	New England Telephone and Telegraph Co.	Telephone rent	52.50
	The Bell Telephone Co., of Philadelphia	do	41.25
	B. H. Adams et al	Office rent	120.00
	Belt Railroad and Stock Yards Co	do	30.00
	The East Buffalo Live Stock Exchange Co	do	90.00
	American Felt Co	Felt	4.95
	H. W. Hawley	Horse and buggy	23.00
	do	Horse and wagon	37.50
	O. E. Dyson	Saddle-horse hire	15.00
	S. W. Burt	do	15.00
	O. W. Snyder	Keep of horse	20.00
	Jno. Forbes	do	45.00
	Samuel E. Cosford	Hire horse and buggy	20.00
	A. E. Behnke	do	35.00
	Thos. A. Bray	Saddle-horse hire	72.00
	Chas. Keane	Hire horse and buggy	25.00
	Jas. W. Davis	do	18.00
	W. V. Davies	Painting room, etc	84.00
	J. W. Roberts	Pigs	33.00
	Don. C. Ayer	Saddle horse	15.00
22	The Geo. W. Knox Express Co	Expressage, etc	1.52

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

BUREAU OF ANIMAL INDUSTRY—SALARIES AND EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
Jan. 22	Merchants Parcel Delivery Co	Hauling	$1.93
	The Chesapeake and Potomac Telephone Co	Telephone rent	19.50
	do	Moving telephone	.75
	W. B. Moses & Sons	Desk	28.20
	Mary Connolly	Traveling expenses	21.83
	Wm. Thompson	Office expenses	9.11
	Mary K. Giblin	Traveling expenses	5.38
23	Goes Lithographing Co	Meat-inspection stamps	569.94
	The Consumers Co	Ice	24.50
	Gehan & Byrne	Office rent	675.00
	Union Stock Yard and Transit Co	do	225.00
	Office Toilet Supply Co	Towel service	153.37
	Chicago Telephone Co	Telephone service	43.75
	Fort Wayne Coal Co	Coal	32.00
	A. Bauman, jr	Hire horse and buggy	20.00
	A. E. Behnke	Office expenses	34.43
	Central Union Telephone Co	Telephone service	18.00
	Nebraska Telephone Co	do	13.50
	Frontier Towel Supply Co	Towel service	11.42
	Bourbon Stock Yard Co	Office rent	30.00
	Iowa Telephone Co	Telephone service	10.50
	Silver Laundry and Towel Co	Towel service	3.24
	G. W. Tourtellott	Office rent	135.00
	Armour Packing Co	Telephone rent	12.50
	Kansas City Stock Yards Co. of Mo	Office rent	49.50
	St. Louis National Stock Yards	do	50.00
	Richards & Conover Hardware Co	Padlocks	15.00
	do	Cutter and plyers	1.00
	Missouri and Kansas Telephone Co	Telephone rent	12.50
	St. Joseph Stock Yards Co	Office rent	90.00
	Page County Bank	do	10.00
	do	do	1.61
	J. A. Turner Co	do	36.00
	H. A. Hedrick	Office expenses	8.10
	Geo. C. Faville	do	11.25
	do	do	5.70
	Jas. M. Codman	Office rent	90.00
24	Eastern Shore of Va. Produce Exchange	Sweet potatoes	27.50
	A. Wilson Bro	Cabbage	.80
	W. M. Galt & Co	Feed for animals	203.35
	Jas. S. Topham	Telescope case	6.90
	Asbestos Paper Co	Asbestos paper	2.70
	W. S. Cass	Horse feed	10.00
	S. E. Bennett	Use saddle horse	23.00
	A. G. G. Richardson	Use horse and buggy, etc	38.00
	H. F. Miller & Son	Ink	14.40
	International Office Toilet Supply Co	Towel service	13.87
	Julius Huelson	Traveling expenses	1.25
	A. F. Martins	do	3.90
	R. A. Ramsay	do	4.25
	Margaret Burke	do	22.45
	W. S. Cass	Office expenses	2.00
	O. E. Dyson	do	14.13
	F. T. Shannon	do	2.15
	Julius Huelson	do	7.52
	H. N. Waller	do	5.25
	do	do	.63
	Hiram Jerome	do	6.55
	A. G. G. Richardson	do	6.67
	Ephraim Dietrich	do	5.93
25	N. C. Sorensen	do	22.85
	Jas. S. Kelley	do	1.25
	Don C. Ayer	do	2.00
	Wm. Thompson	do	10.25
	Fredk. Braginton	do	.60
	M. S. Lantz	Traveling expenses	47.60
	Frank Parker	do	32.50
	J. O. Jacobs	do	82.15
	Robt. H. Treacy	do	44.75
	Raymond Johnson	do	16.25
	Jno. McBirney	Office expenses	3.00
	Thos. J. Turner	do	16.14
	W. H. Rose	do	24.40
	T. A. Shipley	do	10.15
	Boyd Baldwin	do	2.72
	Chas. M. Day	do	18.90
26	E. C. Schroeder	do	9.55
	Jno. R. Mohler	Traveling expenses	37.80
	Denison Manufacturing Co	Meat tags	7.70
28	Chicago Car Seal and Manufacturing Co	Tags and discs	39.15

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

BUREAU OF ANIMAL INDUSTRY—SALARIES AND EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
Jan. 28	Frank D. Ketchum	Office expenses	$4.34
	Jno. Forbes	do	2.10
	E. N. Hutchinson	do	5.50
	Joshua Miller	do	3.00
	Louis K. Green	Traveling expenses	7.15
	do	Office expenses	3.00
	A. J. Payne	do	5.20
	D. Cumming	do	4.75
	Frank C. Eells	Traveling expenses	57.24
	C. F. Palmer	do	30.15
	Thos. Redmond	do	3.00
	The Fredk. C. Gross & Bros. Co.	Office rent	51.00
	Mary L. Burke	Traveling expenses	22.45
	Armstrong Steam Laundry	Laundrying	2.88
	Wm. F. Lavery	Traveling expenses	.75
	W. C. Siegmund	Services	29.35
	Burton R. Rogers	do	3.26
	Geo. Jobson	Traveling expenses	13.03
	C. W. Stiles	Office expenses	1.15
	W. E. Pratt	Hog rings	14.70
29	Mackall Bros	Chemicals	9.24
	E. Burgdorf	Hire horse and buggy	34.00
30	Fred. Springman	Transportation	.30
	New York Telephone Co	Rent of telephone	26.10
	A. G. G. Richardson	Office expenses	23.33
	Chas. A. Schaufler	do	43.65
	Laura S. Ropiequet	Traveling expenses	16.32
31	Marion Dorset et al	Salaries	3,204.19
Feb. 1	Jas. W. Wilson	Traveling expenses	8.15
	United States Envelope Co.	Envelopes	9.88
	Coons & Cole	Potatoes	8.26
	Elastic Tip Co	Supplies	7.10
	C. S. Braisted	Pencils	2.20
	Miller Lock Co	Keys, etc	3.21
	Whitall, Tatum & Co	Flasks	7.81
	S. P. Johnson	Typewriters	125.00
	A. Wilson & Bro.	Rock salt	9.17
	R. W. Hickman	Traveling expenses	20.40
	A. D. Melvin	do	23.55
2	Louis Hartig	Hardware	1.61
	Houghton & Delano	Kodak, etc	27.82
	C. T. Kent	Calf	5.00
	Jas. Laughlin	do	23.00
	P. E. Crowl Co	Stamp, rubber	64.80
5	A. G. G. Richardson	Use horse and buggy	38.00
	do	do	38.00
	D. E. Salmon	Traveling expenses	9.15
	J. Wm. Fink	Services	103.30
6	The Rio Grande Western Rwy. Co	Passenger transportation	42.50
	Great Northern Rwy	do	8.00
	Atlanta, Knoxville and Northern Rwy. Co.	do	4.41
	Norfolk and Western Rwy. Co	do	6.10
	Oregon Short Line R. R. Co	do	18.00
	Chicago and Northwestern Rwy. Co	do	11.02
	Galveston, Harrisburg and San Antonio Rwy. Co.	do	15.75
	do	do	15.75
	The Chesapeake and Ohio Rwy. Co	do	3.85
	Baltimore and Ohio R. R. Co	do	28.50
	Southern Rwy. Co	do	1.40
	Jas. Johnson et al	Salaries	1,448.00
	Jos. M. Good	Services	103.30
7	Rice P. Steddom	do	137.80
	Fredk. W. Hopkins	do	120.60
	W. P. Ellenberger	do	103.30
	Fredk. Dolan	do	103.30
	Jos. M. Turner	do	77.50
	W. M. Foster	do	62.00
	E. P. Schaffter et al	Salaries	500.94
	E. T. Davison et al	do	182.60
	Fredk. Braginton et al	do	182.60
	W. B. Lincoln et al	do	165.30
	Edw. P. Dond et al	do	182.60
	do	Office expenses	.40
	Nathan K. Fegley	do	.50
	W. A. Rose et al	Salaries	961.10
	Nathan K. Fegley et al	do	182.60
	W. H. Rose	Traveling expenses	3.35
	A. G. G. Richardson et all	Salaries	823.10
	Julius Huelsen et al	do	687.20

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

BUREAU OF ANIMAL INDUSTRY—SALARIES AND EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
Feb. 7	H. A. Hedrick et al	Salaries	$489.10
	G. C. Faville et al	do	285.90
	F. W. Huntington et al	do	157.30
	Henry P. Armsby et al	do	184.20
8	Albert Dean	Office expenses	9.19
	Albert Dean et al	Salaries	619.90
	Harry B. Adair	Services	120.60
	Thos. Castor	do	120.60
	Peter I. Kershner	do	120.60
	Harry D. Paxson	do	120.60
	Thos. A. Bray	do	120.60
	L. J. Allen	do	120.60
	W. E. Hill	do	103.30
	Arthur M. Rork	do	103.30
	Wm. G. Shaw	do	103.30
	Wm. D. Jorden	do	103.30
	Louis Metsker	do	103.30
	Chas. E. Steel	do	103.30
	R. J. Blanche	do	103.30
	H. M. Burgess	do	103.30
	Raymond Johnson	do	103.30
	Murray J. Myers	do	103.30
	Munroe B. Miller	do	103.30
	Harry L. McDonald	do	77.50
	Dan McCunningham	do	36.67
	do	do	13.04
	W. S. Cass et al	Salaries	1,205.40
	F. W. Ainsworth et al	do	324.60
	Chas. M. Day	Services	120.60
	Geo. S. Hickox	do	103.30
	Robt. H. Treacy	do	103.30
	Hugh M. Rowe	do	103.30
	R. A. Ramsay	do	101.10
	F. W. Ainsworth	do	5.50
	do	Office expenses	8.00
	H. D. Mayne	Services	103.30
	Jno. A. Bell	do	8.00
	B. Howes	do	103.30
	C. L. Morin	do	24.00
	D. Cumming	do	80.00
	W. J. Murphy et al	Salaries	182.60
9	Niels C. Sorensen et al	do	2,008.57
	Saml. E. Cosford et al	do	182.60
	M. O. Anderson et al	do	103.30
	Geo. Ditewig et al	do	275.60
	W. C. Barth et al	do	198.10
	Frank D. Ketchum et al	do	814.83
	T. J. Turner et al	do	529.70
	T. A. Shipley	do	337.60
	L. K. Greene	do	182.60
	Joshua Miller	do	260.10
	Jas. S. Kelly	do	244.60
11	Eimer & Amend	Muffles	5.55
	Whitall, Tatum & Co	Flasks	1.79
	A. Wilson & Bro	Cabbage	15.25
	M. Du Perow	Lamps	6.50
	do	do	6.50
	Wm. Lochte	Shoeing horses, etc	10.25
	American Ice Co	Ice	14.89
	Allen A. Holcombe	Services	120.60
	Chas. H. Stevens	do	120.60
	A. J. Pistor	do	103.30
	Walter E. Howe	do	103.30
	Jas. Irwin	do	86.10
	Chicago and Northwestern Rwy. Co	Transportation	5.89
	do	do	.22
	do	do	.25
	Chicago, Indianapolis and Louisville Rwy. Co.	do	.26
	Chicago, Burlington and Quincy R. R. Co	do	1.69
	do	do	.25
	Missouri Pacific Rwy. Co	do	1.36
	Lake Shore and Michigan Southern Rwy. Co.	do	.45
	Harry E. Overstreet	do	1.43
	do	do	.96
	do	do	.24
	do	do	.70
	C. A. Schaufler et al	Salaries	840.60
	L. A. Robinson et al	do	1,091.80

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

BUREAU OF ANIMAL INDUSTRY—SALARIES AND EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
Feb. 11	Chas. H. Zink et al	Salaries	$754.40
	do	Office expenses	.50
	Ernest L. Volgenau	Services	120.60
	F. M. Perry	do	120.60
	New York Telephone Co	Telephone services	19.60
12	Levi P. Beechy	Services	103.30
	Lowell Clarke	do	120.60
	W. S. Devoe	do	215.30
	L. Enos Day et al	Salaries	182.60
	Chas. Keane et al	do	399.60
	Ira K. Atherton et al	do	180.60
	O. W. Snyder	Services	120.60
	Frank C. Eells	do	103.30
	Jno. F. Deadman	do	60.00
	Arthur B. Morse	do	11.67
	M. S. Lantz	do	103.30
	Jno. McBirney	do	137.80
	O. B. Hess et al	Salaries	182.60
	W. J. Stewart et al	do	1,553.60
	A. E. Behnke et al	do	1,181.30
	A. J. Payne et al	do	842.20
	Lewis R. Baker et al	do	943.80
	Geo. S. Baker et al	do	421.05
	F. T. Shannon et al	do	198.10
	R. W. Tuck et al	do	458.97
	The Chesapeake and Potomac Telephone Co	Telephone rent	123.75
	Barber & Ross	Drills	3.80
13	Frank Parker	Services	73.33
	G. W. Ward	do	55.00
	Chas. Cowie	do	45.00
	E. A. de Schweinitz	Office expenses	26.19
	Victor A. Norgaard	Traveling expenses	83.10
14	Sarah A. Riley	Services	10.00
	Robt. A. Ramsay	do	103.30
	C. N. Hutchinson et al	Salaries	298.60
	Wm. Thompson et al	do	1,714.94
	J. Otis Jacobs	Services	103.30
	John Forbes et al	Salaries	2,343.93
	Jas. J. Brougham	Office expenses	18.25
	Jas. J. Brougham et al	Salaries	2,239.40
	S. E. Bennett et al	do	6,201.10
	W. B. Niles et al	do	168.10
	Saml. G. Hendren	Services	10.00
	H. N. Waller et al	Salaries	2,719.40
	R. P. Clarke Co	Towels	3.40
	C. Becker	Buckets	3.48
15	Don. C. Ayer et al	Salaries	4,459.38
	B. S. Paddock et al	do	242.80
	Wm. C. Honan	Traveling expenses	19.95
16	E. W. Barthold et al	Salaries	2,268.00
	Morris Wooden et al	do	6,393.15
	Caroline Burnaby	Services	40.00
	W. H. Wray	do	387.50
	do	Traveling expenses	18.65
	do	Office expenses	8.65
	T. A. Geddes	Services	172.20
	G. W. Ward	Traveling expenses	9.00
18	O. E. Dyson et al	Salaries	8,174.18
	Herman Busman et al	do	871.40
	A. R. Wake et al	do	1,225.63
	Boyd Baldwin et al	do	632.43
	J. F. Ryder	Services	172.20
	do	Traveling expenses	47.67
	F. M. Perry	do	31.20
	R. P. Steddom	do	88.51
	W. P. Ellenberger	do	68.50
	W. M. Foster	Office expenses	10.05
	Frederick T. Dolan	Traveling expenses	12.50
19	M. O. Anderson	do	5.95
	T. Byron Cracroft	do	33.95
	M. S. Lantz	do	48.60
	Geo. S. Baker	do	5.20
	Frank Parker	do	2.50
	Robt. H. Treacy	do	95.95
	Walter E. Howe	do	72.00
	Allen A. Holcombe	do	40.18
	Levi P. Beechy	do	62.50
	J. Otis Jacobs	do	64.90
	C. M. Day	do	54.35
	Bausch & Lomb Optical Co	Supplies	45.03

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

BUREAU OF ANIMAL INDUSTRY—SALARIES AND EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
Feb. 19	Rochester Optical and Camera Co	Supplies	$9.60
	Defur & Co	Cages	34.50
	Chas. Cowie	Traveling expenses	3.95
	Danl. S. Hays	do	14.05
	H. D. Mayne	do	8.22
	Wm. D. Jorden	do	74.60
	Albert Dean	do	35.20
	Thos. Castor	do	39.15
	Dan. McCunningham	do	32.00
	Louis Metsker	do	88.10
	Peter I. Kershner	do	3.51
	Howard M. Burgess	do	37.58
	Murray J. Myers	do	33.60
	Harry D. Paxson	do	5.20
	Chas. E. Steel	do	18.25
	H. L. McDonald	do	25.30
	Thos. A. Bray	do	17.90
	A. M. Rork	do	10.25
	M. B. Miller	do	9.95
	W. E. Hill	do	2.00
	R. J. Blanche	do	7.27
	Wm. G. Shaw	do	74.55
	do	do	58.45
	Frank C. Eells	do	57.25
	Hugh M. Rowe	do	101.00
	A. J. Pistor	do	2.38
	W. B. Niles	do	53.15
20	S. R. Burch	do	32.75
	Chas. H. Stevens	do	116.50
	R. A. Ramsay	do	4.00
	Geo. S. Hickox	do	79.60
	L. J. Allen	do	63.85
	Lowell Clarke	do	74.25
	E. C. Schroeder	Office expenses	5.91
	W. S. Cass	Feeding horses	10.00
	S. E. Bennett	Hire of horse, etc	23.00
	O. W. Snyder	Keeping horse	20.00
	A. Bauman	Hire horse and buggy	20.00
	E. Burgdorf	do	21.00
	do	Hire team	35.00
	W. C. Williams	Hire horse and buggy	11.00
	Chas. Keane	do	25.00
	Saml. E. Cosford	do	20.00
	Don C. Ayer	Hire horse	15.00
	Jas. W. Davis	Hire horse and buggy	18.00
	A. E. Behnke	do	35.00
	J. S. Stott	Ink	3.60
	The Waterloo Furniture and Carpet Co	Chairs, etc	8.00
	Waughler Bros	Copy press	4.60
	Edw. S. Schmid	Prepared feed	6.00
21	D. Frank Parker	Mimeograph supplies	17.85
	W. B. Moses & Sons	Chairs	9.35
	J. Baumgarten & Sons	Stenciling plates	3.00
	Wagner Typewriter Co	Typewriters	125.00
	Capital Traction Co	Car tickets	10.00
	W. M. Galt & Co	Feed for animals	276.35
	St. Louis National Stock Yards	Office rent	50.00
	Fort Wayne Coal Co	Coal	16.00
	Hiram W. Hawley	Hire horse and buggy	23.00
	do	Hire horse and wagon	39.00
	Union Stock Yards and Transit Co	Electric current	4.09
	A. P. Little	Mucilage	4.60
	S. W. Burt	Hire saddle horse	15.00
	Stock Yard Paint Co	Supplies	3.25
	O. E. Dyson	Hire saddle horse	15.00
	Wyckoff, Seamans & Benedict	Paper, etc	3.90
	J. Haberle	Repairs to lock boxes	3.00
	Raymond Johnson	Traveling expenses	32.00
	W. S. Cass	Office expenses	2.00
	L. Enos Day	do	3.45
	Boyd Baldwin	do	5.92
	Don C. Ayer	do	1.90
	O. W. Kurtz	Meals and lodging and hire of team, etc.	15.25
	Valley Paper Co	Map paper	32.80
	Julius Huelsen	Office expenses	5.92
	Fredk. W. Ainsworth	do	4.75
	C. L. Morin	Traveling expenses	6.15
	H. T. Potter	Services	3.00
	A. G. G. Richardson	Office expenses	6.69

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

BUREAU OF ANIMAL INDUSTRY—SALARIES AND EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
Feb. 23	Postal Telegraph-Cable Co	Telegraph service	$17.68
	W. S. Devoe	Traveling expenses	50.75
	W. B. Niles	Office expenses	73.25
	Saml. G. Hendren	Traveling expenses	30.50
	do	Office expenses	8.50
	W. H. Rose	do	30.70
25	C. W. Stiles	Traveling expenses	69.16
26	Arthur Sherman	do	9.75
	The A. H. Andrews Co	Furniture	30.50
	W. E. Pratt	Hog rings, etc	15.65
	Houghton & Delano	Prints	3.80
	Western Union Telegraph Co	Telegraph service	2.13
	Wyckoff, Seamans & Benedict	Repairs to typewriter	.25
	United States Electric Lighting Co	Electric current	17.34
	Washington Gaslight Co	Gas	33.70
	Rudolph, West & Co	Hammers, etc	4.82
	Thos. Redmond	Services	38.00
27	Chicago, Rock Island and Pacific Rwy. Co	Passenger transportation	12.50
	Star Union Line	do	1.21
	Illinois Central R. R. Co	do	4.52
	Boston and Maine R. R. Co	do	1.07
	Southern Rwy. Co	do	39.20
	The Lake Shore and Michigan Southern Rwy. Co.	do	10.00
	Chicago, Milwaukee and St. Paul Rwy. Co	do	7.39
	Adams Express Co	Transportation	135.65
28	United States Envelope Co	Envelopes	12.86
	do	do	1.76
	J. P. Nawrath	Sponges	14.00
	Marion Dorset et al	Salaries	3,041.70
Mar. 2	A. Wilson & Bro	Hay and straw	1,908.95
	Leo Baum	Photographic reproductions	7.00
	do	Photographs for annual report	1.25
	The Elastic Tip Co	Rubber stamp holders	26.00
	Dennison Manufacturing Co	Tags	2.35
	do	do	9.80
	do	do	264.00
7	H. N. Waller et al	Salaries	2,442.70
	J. Wm. Fink	Services	93.40
8	E. L. Volgenau	do	108.80
	D. Cumming	do	70.00
	Tooie A. Geddes	do	155.60
	H. D. Mayne	do	93.40
	A. G. G. Richardson et al	Salaries	759.20
	Jas. Johnston et al	do	1,361.20
	Julius Huelsen et al	do	620.60
	Saml. G. Hendren et al	do	127.40
	E. P. Dowd et al	do	164.80
	H. A. Hedrick et al	do	441.80
	N. K. Fegley et al	do	164.80
	F. W. Huntington et al	do	141.40
	W. H. Rose et al	do	919.30
9	Jas. Irwin	Services	77.80
	A. J. Pistor	do	93.40
	M. O. Anderson	do	93.40
	R. A. Ramsay	do	93.40
	Geo. S. Hickox	do	93.40
	Allen A. Holcombe	do	108.80
	Orrin W. Snyder	do	108.80
	A. J. Payne et al	Salaries	752.91
	Albert Dean et al	do	466.80
	Harry D. Paxson	Services	108.80
	L. J. Allen	do	108.80
	Thos. Castor	do	108.80
	Peter I. Kershner	do	108.80
	H. B. Adair	do	108.80
	A. M. Rork	do	108.80
	Thos. A. Bray	do	108.80
	H. B. Miller	do	93.40
	R. Johnson	do	93.40
	W. D. Jorden	do	93.40
	H. M. Burgess	do	93.40
	M. J. Myers	do	93.40
	Geo. C. Moser	do	93.40
	Dan. McCunningham	do	93.40
	W. E. Hill	do	93.40
	Chas. E. Steel	do	93.40
	Wm. G. Shaw	do	93.40
	R. J. Blanche	do	93.40
	Harry L. McDonald	do	70.00

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

BUREAU OF ANIMAL INDUSTRY—SALARIES AND EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
Mar. 9	Fredk. Braginton et al	Salaries	$164.80
	E. P. Schaffter et al	do	447.05
	C. M. Day	Services	108.80
	do	Office expenses	13.50
	Chas. H. Stevens	Services	108.80
	R. P. Steddom	do	124.40
	Fredk. W. Hopkins	do	108.80
	W. P. Ellenberger	do	93.40
	Fredk. T. Dolan	do	93.40
	Jas. W. Turner	do	70.00
	Walter M. Foster	do	56.00
	Goes Lithographing Co	Meat-inspection stamps	588.58
11	F. W. Ainsworth et al	Salaries	286.80
	T. A. Shipley et al	do	304.80
	L. E. Day et al	do	164.80
	S. E. Cosford et al	do	164.80
	Willis P. Lincoln et al	do	117.40
	E. T. Davison et al	do	178.80
	E. N. Hutchinson et al	do	268.80
	Geo. Ditewig et al	do	248.80
	T. J. Turner et al	do	581.60
	J. J. Brougham et al	do	2,028.60
	Boyd Baldwin et al	do	580.20
	Jos. M. Good	Traveling expenses	24.20
	Jos. M. Good et al	Salaries	113.40
	Louis Metsker	Services	93.40
	H. J. Washburn	Traveling expenses	41.65
	R. A. Pearson	do	179.38
12	C. H. Zink et al	Salaries	1,657.60
	C. A. Schaufler et al	do	768.80
	Geo. C. Faville et al	do	258.20
	F. L. Russell	Services	16.00
	Benj. Howes	do	108.80
	F. M. Perry	do	108.80
	Henry P. Armsby et al	Salaries	166.60
	W. J. Murphy et al	do	164.80
	Tooie A. Geddes	Traveling expenses	112.05
	The Franklin County Creamery Association.	Butter	46.05
	Joshua Miller et al	Salaries	234.80
	Ira K. Atherton et al	do	168.80
	Jas. S. Kelly et al	do	164.80
	Louis K. Green et al	do	164.80
	W. C. Barth et al	do	413.60
	Frank D. Ketchum et al	do	741.40
	W. S. Cass et al	do	1,031.80
	Albert E. Behnke et al	do	1,080.80
	S. E. Bennett et al	do	5,634.86
	Lewis R. Baker et al	do	852.40
	O. B. Hess et al	do	164.80
	Chas. Keane et al	do	360.80
	Geo. S. Baker et al	do	390.40
	E. A. de Schweinitz	Office expenses	29.63
	Henry E. Alvord	Traveling expenses	102.25
	R. A. Pearson	do	2.50
13	O. E. Dyson et al	Salaries	8,309.00
	W. B. Niles et al	do	198.80
	Jno. Forbes et al	do	2,282.07
	Don C. Ayer et al	do	4,434.13
	Chas. Cowie	Services	60.00
	C. L. Morin	do	21.00
	Edwd. B. Markham	Hogs	90.00
	C. Wardell Styles	Traveling expenses	132.03
	Merchants' Refrigerating Co	Transportation	429.99
	Jno. C. Parker	Stationery	255.64
14	Benj. S. Paddock et al	Salaries	219.40
	Edwin W. Barthold et al	do	1,848.00
	Morris Wooden et al	do	5,768.93
	Albert E. Behnke et al	do	1,399.12
	R. W. Tuck et al	do	424.07
	N. C. Sorensen et al	do	1,746.10
	S. Kann, Sons & Co	Muslin	1.20
	R. Carter Ballantyne	Pens, etc	80.00
15	Johnson Electric Service Co	Mechanical microscope stage	25.00
	C. H. Bridges	Services	15.00
	Frank Parker	do	93.40
	M. S. Lantz	do	93.40
	H. M. Rowe	do	93.40
	L. P. Beechy	do	93.40

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

BUREAU OF ANIMAL INDUSTRY—SALARIES AND EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
Mar. 15	Jno. McBirney	Services	$124.40
	W. S. Devoe	do	175.00
	Walter E. Howe	do	93.40
	J. Otis Jacobs	do	93.40
	R. H. Treacy	do	93.40
	Frank E. Eells	do	93.40
	Jno. McBirney	Traveling expenses	105.82
	F. T. Shannon et al	Salaries	205.47
	W. H. Gibbs et al	do	32.00
16	W. H. Rose	Office expenses	19.45
	Julius Huelsen	do	5.60
	Nathan K. Fegley	do	.50
	do	do	.50
	J. F. Ryder	Traveling expenses	47.67
	do	Services	155.60
	G. W. Ward	Traveling expenses	11.75
	do	Services	60.00
	F. M. Perry	Traveling expenses	10.70
	F. L. Russell	do	8.35
	H. D. Mayne	do	8.92
	C. L. Morin	do	5.95
	Chas. Cowie	do	15.35
	Jno. A. Bell	Services	32.00
	W. S. Devoe	Traveling expenses	72.10
	do	do	53.62
	Geo. S. Hickox	do	39.50
	Chas. M. Day	do	30.00
	M. S. Lantz	do	22.50
	Levi P. Beechy	do	32.00
	Ernest N. Hutchinson	Office expenses	10.95
	Geo. S. Baker	Traveling expenses	5.20
	W. B. Niles	do	40.20
	do	Office expenses	50.50
	Frank T. Shannon	Traveling expenses	10.55
	W. S. Cass	Office expenses	3.50
	Frank C. Eells	Traveling expenses	26.25
	Mary A. Atwood et al	Salaries	77.63
	O. E. Dyson	Office expenses	8.63
	Evalina M. Shepard	Services	2.51
	G. A. Lytle	Traveling expenses	14.59
	Lila Robinson	Services	18.33
	W. C. Honan	Traveling expenses	18.25
	Jno. Forbes	Office expenses	8.70
	F. L. De Wolf	Traveling expenses	28.25
	R. A. Ramsay	do	7.75
	Jas. W. Chowning	do	12.30
	Frank Parker	do	11.50
	T. Byron Cracroft	Services	65.40
	Wm. E. Hall	Traveling expenses	5.80
	William Thompson	Office expenses	17.74
	do	do	8.14
	Albert Dean	Traveling expenses	15.95
	Peter I. Kershner	do	27.71
	Geo. C. Moser	do	40.40
	Richd. J. Blanche	do	11.99
	Howard M. Burgess	do	3.25
	Harry D. Paxson	do	6.40
	W. E. Hill	do	3.00
	Arthur M. Rork	do	15.50
	Dan. McCunningham	do	18.41
	Lowell Clarke	Services	108.80
	E. C. Schroeder	Office expenses	5.75
18	Chicago Car Seal and Manufacturing Co	Tags	34.65
	do	do	31.50
	Wm. Thompson et al	Salaries	1,436.70
	Raymond Johnson	Traveling expenses	18.90
	C. E. Udell & Co	Cheese	19.11
	O. E. Dyson	Office expenses	9.70
	Boyd Baldwin	do	4.92
	Don C. Ayer	do	3.23
	E. N. Hutchinson	do	30.95
	Martha A. Britton	Traveling expenses	2.75
	Chas. M. Day	Office expenses	8.00
	Chas. H. Stevens	Traveling expenses	36.65
	O. B. Hess	do	2.95
	A. G. Bibb	do	17.70
	Hugh M. Rowe	do	69.50
	Jno. McBirney	do	64.75
	Chas. E. Steel	do	22.05
	Thos. Castor	do	25.40

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

BUREAU OF ANIMAL INDUSTRY—SALARIES AND EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
Mar. 18	L. J. Allen	Traveling expenses	$45.00
	Louis Metsker	do	65.40
	W. D. Jorden	do	61.60
	R. P. Steddom	do	99.11
	W. P. Ellenberger	do	51.50
	Spring Brook Creamery Co	Butter	17.37
	Louis Hax Furniture Co	Window shades	4.75
	Schiel & Carson	Stove	15.25
	International Seal and Lock Co	Car seals	125.00
	Goes Lithographing Co	Meat inspection stamps	917.02
	Z. D. Gilman	Supplies	14.07
	do	do	78.22
	Jas. S. Topham	Telescope case	1.00
	do	Straps	9.00
	American Ice Co	Ice	13.09
	Rudolph, West & Co	Hammers, etc	45.24
	J. A. Turner Co	Office rent	18.43
	M. Benson	Cheese	23.69
	Bausch & Lomb Optical Co	Supplies	20.73
	United States Envelope Co	Envelopes	112.70
	Dennison Manufacturing Co	Meat tags	3.15
	A. G. G. Richardson	Office expenses	5.94
	Rosemary Creamery Co	Butter	19.60
19	New York Prisen Co	Canopy	47.00
	J. P. Nawrath	Twine	6.38
	The Friedenwald Co	Certificates	17.50
	Wm. E. Pratt	Hog ringers	8.22
	Thos. Somerville & Sons	Lime, etc	16.14
	M. G. Copeland & Co	Flag	3.45
	Jas. B. Lambie	Horse clippers, etc	26.87
	Leidy S. Depue	Oats	33.00
	Houghton & Delano	Prints	2.44
	The Geo. W. Knox Express Co	Transportation	1.37
20	W. H. Wray	Services	350.00
	do	Traveling expenses	14.78
	do	Office expenses	5.76
	Caroline Burnaby	Services	40.00
	Jas. W. Davis	Use of horse and buggy	18.00
	H. W. Hawley	Use of horse and wagon	36.00
	do	Use of horse and buggy	23.00
	F. W. Ainsworth	Office expenses	4.70
	J. C. Beattie	Repairs to furniture, etc	23.00
	Wm. Lochte	Shoeing horses, etc	12.50
	Edw. S. Schmidt	Prepared feed	7.00
	Eastern Shore of Virginia Produce Exchange	Sweet potatoes	20.00
21	Schwarzschild & Sulzberger Co	Freight	396.03
	Richd. W. Hewitt	Traveling expenses	4.52
	A. G. G. Richardson	Horse hire	38.00
	Simpson, McIntire & Co	Butter	25.00
	L. S. Ropiequet	Traveling expenses	5.10
	E. J. Foreman	Car fare	9.60
	A. J. Pistor	Traveling expenses	5.29
	Chicago Car Seal and Manufacturing Co	Tags	73.58
	do	Disks	56.20
	A. E. Behnke	Horse hire	35.00
	W. S. Cass	Feeding horse	10.00
	O. W. Snyder	Keeping horse	20.00
	Don C. Ayer	do	15.00
	A. Greenwood & Co	Painting floor	3.50
	A. Bauman, jr	Horse hire	20.00
	W. P. Campbell	Pigs	60.00
	Saml. E. Cosford	Horse hire	20.00
	American Desk Co	Furniture	28.00
	O. E. Dyson	Horse hire	15.00
	Ft. Wayne Coal Co	Coal	32.00
	Marshall Field & Co	Felt	6.67
	S. W. Burt	Horse hire	15.00
	St. Louis National Stock Yards	Rent	50.00
	Chas. Keane	Horse hire	25.00
	S. E. Bennett	do	23.00
	Houghton & Delano	Developing films	4.80
	D. Frank Parker	Typewriter paper	45.00
	A. Wilson & Bro	Cabbage	25.15
	W. M. Galt & Co	Feed	658.35
23	R. Carter Ballantyne	Labels	.32
	The Kny Sheerer Co	Glass barrels	12.40
25	A. A. Holcombe	Traveling expenses	87.64
	United States Electric Lighting Co	Electric current	15.41
	Washington Gas Light Co	Gas	33.20

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

BUREAU OF ANIMAL INDUSTRY—SALARIES AND EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
Mar. 25	The Chesapeake and Potomac Telephone Co.	Telephone service	$0.80
	Jno. C. Parker	Knives	.65
27	A. D. Melvin	Traveling expenses	8.60
	Wagner Typewriter Co	Typewriter attachments	4.50
	Allen Stephenson & Co	Furniture	36.00
	Hall & Hawkins	do	35.25
	W. G. Shaw	Traveling expenses	69.20
	A. E. Harris	do	12.55
	Murray J. Myers	do	14.21
	Joshua Miller	Office expenses	6.53
	Mary K. Giblin	Traveling expenses	.85
	Sterchi Bros	Furniture	55.00
29	The Friedenwald Co	Certificates meat inspection	650.00
30	Marion Dorset et al	Salaries	3,312.55
	Total, third quarter		236,252.66
Apr. 1	R. W. Hickman	Traveling expenses	2.65
	Pennsylvania Co	Passenger transportation	17.50
	Illinois Central R. R. Co	do	16.94
	Galveston, Harrisburg, and San Antonio Rwy. Co.	do	22.05
	Baltimore and Ohio R. R. Co	do	51.50
	do	do	17.50
	The Missouri Pacific Rwy. Co	do	33.50
	Pennsylvania R. R. Co	do	88.50
	Union Pacific R. R. Co	do	5.05
	Burlington and Missouri Pacific R. R. Co	do	20.45
	The Chicago, Burlington, and Quincy R. R. Co.	do	9.04
	do	do	4.66
	New York, Texas, and Mexican Rwy. Co	do	39.70
	The Chesapeake and Ohio Rwy. Co	do	55.50
	Missouri, Kansas, and Texas Rwy. Co	do	4.16
	J. Wm. Fink	Services	103.30
	W. C. Pennywitt	Traveling expenses	6.60
2	Elmer H. Catlin & Co	Telescope tubes, etc	7.69
	R. P. Clarke Co	Cloth	1.83
	Mackall Bros	Supplies	162.25
	Leo Baum	Material for illustrations	12.50
	W. B. Moses & Sons	Chairs	48.25
	Jas. B. Lambie	Chuck	7.50
	do	Repairing screws, etc	1.81
	Jno. E. First	Services	14.00
	W. C. Barth	Office furniture	45.00
3	Miller Lock Co	Padlock	21.00
	Eimer & Amend	Supplies	9.50
	do	Distilling bulbs	7.20
	The Publishers & Printers' Engraving Co.	Engraving	7.31
	Wm. Kraft	Cover slips	5.10
	Phillip Lindemeyr	Ink pad	9.00
	W. B. Badger & Co	Office furniture	31.00
	United States Envelope Co	Envelopes	12.94
	Library Bureau	Cards, etc	15.65
	Eberhard Faber	Bands	2.90
	Standard Oil Co	Paraffin	9.90
	Simeon Trenner	Water motor	22.00
	H. J. Washburn	Services	103.30
4	R. W. Hickman	Traveling expenses	21.95
	Albert Dean et al	Salaries	516.60
	P. I. Kershner	Services	120.60
	A. M. Rork	do	120.60
	F. T. Shannon	do	120.60
	R. J. Blanche	do	120.60
	Thos. Castor	do	120.60
	H. B. Adair	do	120.60
	Thos. A. Bray	do	120.60
	A. R. Wake	do	120.60
	L. J. Allen	do	120.60
	Harry D. Payson	do	120.60
	M. B. Miller	do	120.60
	Louis Metsker	do	103.30
	W. E. Hill	do	103.30
	M. J. Myers	do	103.30
	H. M. Burgess	do	103.30
	Geo. C. Moser	do	103.30
	W. G. Shaw	do	103.30
	Wm. D. Jordden	do	103.30
	Danl. McCunningham	do	103.30

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

BUREAU OF ANIMAL INDUSTRY—SALARIES AND EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
Apr. 4	Harvey L. McDonald	Services	$77.50
5	W. B. Lincoln	do	103.30
	Jos. M. Good et al	Salaries	165.30
	Fredk. Braginton et al	do	182.60
	Geo. Ditewig et al	do	275.60
	Joshua Miller et al	do	256.17
	T. A. Shipley et al	do	237.30
	W. C. Barth et al	do	458.20
	E. P. Schaffter et al	do	499.98
	A. J. Payne et al	do	762.23
	L. R. Baker et al	do	943.80
	W. H. Rose et al	do	1,019.10
	Julius Huelsen et al	do	687.20
	H. A. Hedrick et al	do	489.10
	N. K. Fegler et al	do	182.60
	E. L. Valgenau	Services	120.60
	H. D. Mayne	do	103.30
	Saml. G. Hendren	do	120.60
6	W. S. Cass et al	Salaries	1,189.90
	Jno. Forbes et al	do	2,549.73
	W. J. Stewart et al	do	912.93
	A. E. Behnke et al	do	1,141.96
	Boyd Baldwin et al	do	642.40
	L. K. Green et al	do	182.60
	Ira K. Atherton et al	do	185.60
	W. B. Niles et al	do	208.10
	R. P. Steddom et al	do	210.10
	W. P. Ellenberger	Services	103.30
	F. T. Dolan	do	103.30
	Jos. M. Turner	do	77.50
	W. M. Foster	do	62.00
8	R. A. Ramsay	do	103.30
	Allen A. Holcombe	do	120.60
	Asa N. McQueen	do	20.00
	D. Cumming	do	95.00
	C. A. Schaufler et al	Salaries	981.90
	E. P. Dowd et al	do	182.60
	G. C. Faville et al	do	285.90
	Jas. Johnson et al	do	1,499.40
	A. G. G. Richardson et al	do	840.40
	C. L. Morin	Services	30.00
	Chas. Cowie	do	65.00
	F. M. Perry	do	120.60
	W. J. Murphy et al	Salaries	182.60
	F. W. Huntington et al	do	155.30
	H. N. Waller et al	do	2,695.23
9	Morris Wooden et al	do	6,050.45
	E. W. Barthold et al	do	1,939.30
	Saml. E. Bennett et al	do	6,279.83
	F. W. Ainsworth et al	do	319.60
	C. H. Zink et al	do	1,824.20
	E. A. de Schweinitz	Office expenses	26.04
	The Maurice Joyce Engraving Co	Engraving	1.00
10	Z. D. Gilman	Chemicals	12.50
	O. E. Dyson et al	Salaries	8,245.80
	H. T. Potter	Traveling expenses	2.25
	do	Services	11.00
	Jno. A. Bell	do	8.00
	O. B. Hess et al	Salaries	182.60
	E. R. Hutchinson et al	do	298.60
	E. T. Davison et al	do	198.10
	Saml. E. Cosford et al	do	182.60
	L. Enos Day et al	do	182.60
	Clarence Loveberry et al	do	180.80
	W. H. Gibbs et al	do	165.30
	do	Traveling expenses	4.60
	Richd. W. Tuck et al	Salaries	457.30
	Niels C. Sorensen et al	do	1,866.13
	Herman Busman et al	do	888.70
	W. C. Honan	Traveling expenses	19.65
	Benj. S. Paddock et al	Salaries	242.80
	Wm. C. Siegmund	Traveling expenses	36.35
11	Chas. M. Day	do	14.16
	do	Services	120.60
	M. O. Anderson	do	120.60
	Geo. S. Hickox	do	103.30
	Frank C. Eells	do	103.30
	W. E. Howe	Traveling expenses	68.25
	do	Services	103.30
	Lowell Clarke	Traveling expenses	54.25

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

BUREAU OF ANIMAL INDUSTRY—SALARIES AND EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
Apr. 11	Lowell Clarke	Services	$120.60
	Chas. H. Stevens	Traveling expenses	31.75
	do	Services	120.60
	J. Otis Jacobs	Traveling expenses	53.20
	do	Services	103.30
	Flora A. Ayers	do	25.00
	Maggie Murphy	do	18.33
	Hugh M. Rowe	do	103.30
	Frank Parker	do	103.30
	M. S. Lantz	do	103.30
	L. P. Beechy	do	103.30
	A. J. Pistor	do	103.30
	R. H. Treacy	do	103.30
	Jno. McBirney	do	137.80
	O. W. Snyder	do	120.60
	Jas. Irwin	do	86.10
	W. R. Fleming	Traveling expenses	8.97
	Mary A. Atwood et al	Salaries	16.67
	Don C. Ayer et al	do	4,795.22
	Jas. J. Brougham et al	do	2,187.00
	Wm. Thompson et al	do	1,087.80
	F. D. Ketchum et al	do	823.10
	T. J. Turner et al	do	755.03
	Geo. S. Baker et al	do	432.30
	Chas. Keane et al	do	399.60
12	F. M. Perry	Traveling expenses	12.20
	Chas. Cowie	do	13.05
	G. W. Ward	Services	70.00
	do	Traveling expenses	11.80
	H. A. Hedrick	Office expenses	8.25
	Louis A. Robinson	Traveling expenses	.85
	A. F. Martins	do	3.25
	Jno. P. O'Leary	do	1.60
	Saml. G. Hendren	Office expenses	1.40
	Jno. A. Bell	Traveling expenses	6.12
	H. D. Mayne	do	27.82
	C. L. Morin	do	5.95
	Eimer & Amend	Glass tubes	2.70
	Lestrade Bros	Butter	15.60
	Stienhardt & Kelly	do	38.00
	Jas. S. Kelly et al	Salaries	252.60
	L. Enos Day	Office expenses	1.50
	Howard M. Burgess	Traveling expenses	5.13
	Wm. Thompson	Office expenses	3.00
	Robt. Darling	Traveling expenses	27.85
	R. A. Ramsay	do	17.00
	A. N. McQueen	Services	35.00
	Myrtle A. Hunt	do	6.67
	Harry D. Paxson	Traveling expenses	8.35
	Geo. E. Totten	do	15.10
	W. E. Hill	do	2.00
	Jos. W. Parker	do	18.90
	Dan McCunningham	do	15.27
	E. T. Davison	do	9.75
	A. J. Payne	Office expenses	7.21
	R. P. Steddom	Traveling expenses	12.45
	Fred. W. Hopkins	Services	120.60
	W. P. Ellenberger	Traveling expenses	18.90
	Wilcox & Harvey Manufacturing Co	Cattle markers, etc	4.60
	Mary Connolly	Traveling expenses	5.00
	Iowa Telephone Co	Rent and services	2.70
	Chas. H. Canfield	Traveling expenses	18.40
	W. B. Niles	do	13.75
	A. L. Faunce	do	12.10
	Allen A. Holcombe	do	45.53
	B. Howes	Services	120.60
	A. E. Behnke	Office expenses	3.30
	do	do	34.20
13	A. G. G. Richardson	do	5.20
	do	do	6.84
	do	do	34.07
	Julius Huelson	do	15.20
	Harry M. Ball	Traveling expenses	5.25
	C. H. Zink	Office expenses	.75
	Chas. A. Schaufler	do	35.80
	Harry N. Waller	do	10.70
	Eph. Dietrich	do	6.81
	W. H. Rose	do	21.70
	Hiram Jerome	do	5.55
	W. M. Foster	do	10.15

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

BUREAU OF ANIMAL INDUSTRY—SALARIES AND EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
Apr. 13	Thos. J. Turner	Office expenses	$21.95
	R. H. Treacy	Traveling expenses	45.30
	Geo. C. Moser	do	44.50
	Chas. E. Steel	do	41.05
	Frank T. Shannon	do	100.00
	M. B. Miller	do	48.90
	Chas. Pearson	do	21.55
	Albert Dean	do	33.10
	Louis Metsker	do	43.75
	E. C. Schroeder	Office expenses	5.91
15	F. L. Russell	Services	16.00
	do	Traveling expenses	7.35
	W. N. D. Bird	do	1.60
	Clarence O. Durfee	do	4.85
	C. H. Bugbee	Services	60.00
	B. Howes	Traveling expenses	32.80
	Jno. Forbes	Office expenses	3.00
	A. J. Pistor	do	8.09
	Geo. W. Butler	Traveling expenses	10.45
	Wm. Yenner	do	3.35
	T. A. Shipley	Office expenses	10.25
	Arthur M. Rork	Traveling expenses	33.02
	Murray J. Myers	do	58.00
	Thos. Castor	do	41.95
	L. J. Allen	do	51.10
16	Whitall, Tatum & Co	Medicines	2.21
	Tooie A. Geddes	Services	172.20
	W. B. Niles	Office expenses	18.00
	J. Manz Engraving Co	Engraving	48.00
	Boyd Baldwin	Office expenses	5.12
	Wm. D. Jorden	Traveling expenses	87.22
	Hiram W. Hawley	Services, etc	39.00
	O. E. Dyson	do	15.00
	Fort Wayne Coal Co	Coal	8.00
	W. S. Cass	Horse feed	10.00
	Jno. Forbes	Hire horse, etc	45.00
	Z. D. Gilman	Chemicals	35.29
	do	do	25.97
	Thos. Somerville & Sons	Fairbanks W. W. valves	6.24
	Wm. Lochte	Shoeing horses, etc	8.00
	M. Du Perow	Telephones, etc	37.00
	Henry E. Alvord	Office expenses	139.50
17	O. E. Dyson	do	10.62
	Brink's Chicago City Express Co	Services	23.55
	The Consumers Co	Ice	18.81
	Hiram W. Hawley	Use horse, etc	23.00
	Chicago Telephone Co	Services	43.75
	S. W. Burt	Use saddle horse	15.00
	Hibbard, Spencer, Bartlett & Co	Clippers, etc	3.00
	Office Toilet Supply Co	Towels	132.50
	Rand, McNally & Co	Record book	5.50
	Don. C. Ayer	Use of horse	15.00
	Don C. Ayer	Office expenses	.85
	Frontier Towel-Supply Co	Towels	5.87
	Jas. W. Davis	Use horse, etc	18.00
	St. Joseph Stock Yards Co	Office rent	135.00
	Chas. Keane	Use horse and buggy	25.00
	Sam'l E. Cosford	do	20.00
	Armstrong Laundry	Towels	2.62
	A. Bauman, jr	Use horse and buggy	20.00
	J. Otis Jacobs	Traveling expenses	13.35
	M. S. Lantz	do	7.25
	A. E. Behnke	Use horse and buggy	35.00
	S. E. Bennett	Use saddle horse	23.00
	F. P. Burnap Stationery and Printing Co	Ink	6.00
	Wyandotte Gas Co	Gas	3.08
	Emery Bird Thayer Dry Goods Co	Soap	7.00
	The Kansas City Stock Yards Co. of Missouri.	Office rent	49.50
	Thos. A. Bray	Use saddle horse	72.00
	A. R. Wake	Traveling expenses	7.30
	Gem Fiber Package Co	Butter boxes	8.50
	W. S. Devoe	Services	172.20
	American Ice Co	Ice	16.22
	E. Burgdorf	Hire horse and buggy	35.00
	A. Wilson & Bro	Cabbage	13.10
	Leo Baum	Material for illustrations	4.50
	Chas. Becker	Oil	105.30
	Henry E. Alvord	Traveling expenses	12.80
18	H. P. Armsby et al	Salaries	184.20

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

BUREAU OF ANIMAL INDUSTRY—SALARIES AND EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
Apr. 18	Chas. A. Schaufler	Use of horse	$60.00
	A. G. G. Richardson	Use of horse and buggy	38.00
	Gerald E. Street	Services	24.00
	C. H. Zink	Use horse and buggy	120.00
	East Buffalo Live Stock Exchange Co	Office rent	90.00
	E. J. Brooks & Co	Compressor glasses	74.00
	Dennison Manufacturing Co	Meat tags	8.80
	The Okonite Co., Limited	Wire	15.00
	Jas. Stikeman	Office rent	125.00
	The Bell Telephone Co. of Philadelphia	Telephone service	41.25
	J. F. Ryder	Traveling expenses	50.34
	do	Services	172.20
	Hugh M. Rowe	Traveling expenses	77.25
	C. H. Bugbee	do	82.05
	Lowell Clarke	do	37.25
	Chas. M. Day	Office expenses	9.25
	C. Deaderick	Office rent	34.84
	W. E. Pratt	Hog rings	154.07
	The Fredk. C. Gross & Bros. Co	Office rent	51.00
	Geo. S. Baker	Office expenses	.90
	Walter E. Howe	Traveling expenses	73.75
	Geo. S. Hickox	do	88.75
19	N. Rufus Gill	Office rent	31.25
	Chesapeake & Potomac Telephone Co	Rent telephone	19.50
	International Toilet & Supply Co	Towels	3.21
	Jas. M. Codman	Office rent	90.00
	New England Telephone & Telegraph Co	Service	52.50
	Bay State Clean Towel Co	Towels	3.00
	J. F. Turner	Copy of act furnished	.75
	Spring Brook Creamery Co	Butter	108.00
	The Franklin County Creamery Association.	do	62.04
	Hanford-Hazelwood Creamery Co	do	72.00
	Nebraska Telephone Co.	Rent telephone	13.50
	St. Louis National Stock Yards	Rent office	50.00
	New Telephone Co	Service	20.00
	Belt R. R. and Stock Yards	Rent of office	30.00
	Silver Laundry and Towel Co	Towel service	3.46
	Jas. Sullivan	Coal	14.00
	Armour Packing Co	Rent telephone	12.50
	Cutler & Neilson Paint, etc. Co	Thinner	3.75
	G. W. Tourtellot	Rent office	135.00
	F. D. Ketchum	Use horse and buggy	20.00
	F. H. Jenkins	Calf	25.00
	The Layton Co	Supplies	19.80
	Gahan and Burns	Rent office	675.00
	Union Stock Yards and Transit Co	do	225.00
	Chicago Car Seals and Manufacturing Co	Tags	32.40
	do	Discs	96.80
	Per Ehrenheim	Rent office	43.93
	Missouri and Kansas Telephone Co	Rent telephone	12.50
	Iowa Telephone Co	Service	10.50
	Church & Stephenson	Lumber	338.53
	Rudolph, West & Co	Supplies	183.84
	Lutz & Co	do	77.20
	Axel Holling	Traveling expenses	82.25
	do	do	73.33
	do	do	62.25
20	Bausch & Lomb Optical Co	Supplies	20.65
	do	Aluminum shields	.75
	F. H. Lovell & Co	Clocks	11.56
	Washington Gaslight Co	Gas	39.90
	Houghton & Delano	Eikonogen, etc	.84
	do	Deed plates	5.56
	United States Electric Lighting Co	Electric current	16.14
	P. Mann & Co	Harness, etc	21.75
	Hugh Reilly	Material for paint	6.10
	R. P. Clarke Co	Towels, etc	45.00
	David M. Nesbit	Report of sweet potatoes	125.00
	H. E. Overstreet	Transportation	.24
	New York, New Haven and Hartford R. R.	do	.82
	do	do	1.30
	Missouri Pacific Rwy. Co	do	1.53
	Atchison, Topeka and Santa Fe Rwy. Co	do	2.42
	do	do	9.98
	do	do	19.48
	Chicago, Burlington and Quincy R. R. Co	do	.82
	do	do	.58
	Chicago and Erie R. R. Co	do	21.78
	Kansas City, St. Joseph and Council Bluffs R. R. Co.	do	2.12

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

BUREAU OF ANIMAL INDUSTRY—SALARIES AND EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
Apr. 20	Star Union Line	Transportation	$0.62
	Pennsylvania Co	do	.67
	Chicago and Northwestern Rwy. Co	do	.29
	Wisconsin Central Rwy. Co	do	.21
	Burlington and Missouri River R. R. Co	do	8.35
	New York, Chicago and St. Louis R. R. Co	do	.47
	Pennsylvania R. R. Co	do	.35
	do	do	.35
	Chicago, Milwaukee and St. Paul Rwy. Co	do	.75
	Lake Shore and Michigan Southern Rwy. Co	do	.49
22	Chas. E. Steel	Services	13.33
	The New York and Porto Rico Steamship Co.	Passenger transportation	55.00
	The International and Great Northern R. R. Co.	do	4.60
	San Antonio and Aransas Pass Rwy. Co	do	2.80
	Union Pacific R. R. Co	do	4.57
	Southern Rwy. Co	do	9.30
	Chicago, Milwaukee and St. Paul Rwy. Co	do	7.59
	Missouri Pacific Rwy. Co	do	27.75
	The Chesapeake and Ohio Rwy. Co	do	27.00
	The Wabash R. R. Co	do	33.00
	Pennsylvania R. R. Co	do	31.00
	Chicago & Alton Rwy. Co	do	27.75
	Fred. A. Schmidt	Drawing paper, etc	25.58
23	Gazette Publishing Co	Advertising	2.50
	San Francisco Chronicle	do	5.50
	Grand Trunk Rwy. Co	Passenger transportation	5.05
	Chicago Car Seal Manufacturing Co	"Condemned" tags	19.20
	Goes Lithographing Co	Meat inspection stamps	809.38
	O. W. Snyder	Keeping horse	16.77
	Mackall Bros	Supplies	88.55
	W. W. Long	Traveling expenses	29.88
24	S. R. Burch	do	17.65
25	Edw. S. Schmid	Prepared feed	7.00
	Lewis Hartig	Hardware	2.40
	New York Telephone Co	Telephone rent	26.30
	E. P. Schaffter	Office expenses	1.10
	F. Clark	Horse	140.00
	F. W. Ainsworth	Office expenses	2.80
	M. O. Anderson	do	1.45
	Jas. J. Brougham	do	13.70
	Fredk. Braginton	do	1.58
	Fredk. T. Dolan	Traveling expenses	8.45
	Albert Dean	Office expenses	6.54
	P. I. Kershner	do	39.23
	John McBirney	do	87.00
	W. S. Devoe	do	64.62
	Frank Parker	do	71.25
	W. B. Niles	do	75.00
	do	do	24.80
	Crosby & Myers	Cheese	108.46
	J. Haberle	Repairing lock boxes	3.75
	J. J. Van Eaton, guardian to W. J. Collier	Office rent	7.00
27	W. C. Pennywitt	Traveling expenses	36.70
	Adams Express Co	Transportation	89.49
	United States Express Co	do	10.31
	Bourbon Stock Yard Co	Office rent	30.00
	Geo. S. Baker	Traveling expenses	5.30
	R. G. Merrill	do	4.00
	Cora A. Houseman	do	3.90
	W. S. Cass	Office expenses	2.00
	Joseph S Keane	Traveling expenses	21.25
	Hardie Wyatt	do	11.55
29	Whitall, Tatum & Co	"Beakers"	12.51
	do	Flasks	5.50
	Eimer & Amend	Furnace mufflers	7.60
	New York Telephone Co	Rent and service	21.00
	Caroline Burnaby	Services	40.00
	Chicago, Burlington and Quincy R. R. Co	Transportation	.69
	Star Union Line	do	12.08
	Michigan Central R. R. Co	do	.45
	do	do	.72
	Burlington and Missouri River R. R. in Nebraska.	do	.25
	Chicago, Rock Island and Pacific Rwy. Co	do	4.12
	do	do	1.14
	do	do	1.01
	Boston and Albany R. R. Co	do	.79
	Lake Shore and Michigan Southern Rwy. Co.	do	1.74

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

BUREAU OF ANIMAL INDUSTRY—SALARIES AND EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
Apr. 29	Pittsburg, Cincinnati, Chicago and St. Louis Rwy. Co.	Transportation	$0.48
	Chicago and Northwestern Rwy. Co	do	1.17
	do	do	.67
	Baltimore and Ohio R. R. Co	do	1.17
	Cleveland, Cincinnati, Chicago and St. Louis Rwy. Co.	do	.52
	do	do	2.40
	Chicago and Erie R. R. Co	do	7.97
	Pennsylvania R. R. Co	do	.35
	do	do	.35
	do	do	2.21
	Pennsylvania Co	do	.40
30	Geo. C. Faville	Office expenses	21.40
	T. A. Geddes	Traveling expenses	22.87
	do	Office expenses	3.89
	Marion Dorset et al	Salaries	3,334.99
May 1	R. W. Hickman	Traveling expenses	17.85
	Geo. H. Parks	do	18.55
	E. J. Brooks & Co	Seals and wires	795.00
	Estate of W. J. Brooke, Helen Brooke, executrix.	Post-hole diggers	17.50
2	International Seal and Lock Co	Car seals	125.00
	Tyer Rubber Co	Rubbers, etc	11.86
	L. G. Orndorff	Cart and baskets	36.25
	W. B. Moses & Sons	Furniture	64.15
3	The Chespeake and Potomac Telephone Co.	Telephone rent	123.75
	do	Telephone services	1.00
4	N. K. Fegley et al	Salaries	174.70
	W. H. Rose et al	do	963.00
	H. A. Hedrick et al	do	468.00
	E. P. Dowd et al	do	174.70
	Julius Huelsen et al	do	657.60
	A. G. G. Richardson et al	do	823.60
	Jas. Johnson et al	do	1,442.20
	F. W. Huntington et al	do	150.90
	H. J. Washburn	Services	98.90
	N. K. Fegley	Office expenses	.75
	H. D. Mayne	Services	98.90
	Saml. G. Hendren	do	115.40
	E. L. Volgenau	do	115.40
6	J. B. Archer	Calves	50.00
	J. H. & G. T. Teachout	Calf	25.00
7	H. N. Waller et al	Salaries	2,628.22
	C. A. Schaufler et al	do	949.42
	Fred Braginton et al	do	174.70
	W. J. Stewart et al	do	509.36
	F. W. Ainsworth et al	do	418.70
	W. B. Niles et al	do	230.40
	L. R. Baker et al	do	903.10
	A. J. Payne et al	do	969.55
	E. P. Schaffter et al	do	538.70
	R. P. Steddom et al	do	201.10
	C. A. Zink et al	do	1,789.97
	W. J. Murphy et al	do	174.70
	Geo. C. Faville et al	do	273.60
	W. B. Lincoln	Services	98.90
	Jos. M. Turner	do	74.20
	F. T. Dolan	do	115.40
	M. J. Myers	do	98.90
	W. M. Foster	do	59.30
	F. W. Hopkins	do	115.40
	W. P. Ellenberger	do	98.90
	W. H. Wray	do	387.50
	Toyo Kisen Kaisha	Passenger transportation	397.50
8	S. E. Bennett et al	Salaries	5,978.69
	W. E. Cass et al	do	1,102.64
	Thos. J. Turner et al	do	792.83
	Jas. S. Kelly et al	do	248.90
	Jos. M. Good et al	do	158.20
	Albert Dean et al	do	578.50
	Niels C. Sorensen et al	do	1,739.59
	do	Office expenses	13.42
	E. C. Schroeder	do	6.30
	Geo. S. Hickox	Services	98.90
	R. J. Blanche	do	115.40
	Thos. Castor	do	115.40
	F. T. Shannon	do	115.40
	L. J. Allen	do	115.40
	C. L. Morin	do	46.00

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

BUREAU OF ANIMAL INDUSTRY—SALARIES AND EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
May 8	F. M. Perry	Services	$115.40
	Chas. M. Day	do	115.40
	do	Office expenses	24.20
	do	Traveling expenses	23.65
	A. A. Holcombe	Services	115.40
	Jas. Irwin	do	82.40
	D. Cumming	do	90.00
	M. O. Anderson	do	115.40
	Chas. A. Brown	do	74.20
	Harry L. McDonald	do	74.20
	Jos. W. Parker	do	98.90
	Dan McCunningham	do	98.90
	Geo. W. Browning	do	98.90
	M. B. Miller	do	98.90
	Wm. D. Jorden	do	98.90
	Wm. G. Shaw	do	98.90
	Geo. E. Totten	do	98.90
	Louis Metsker	do	98.90
	W. E. Hill	do	98.90
	Geo. C. Moser	do	98.90
	H. D. Paxson	do	115.40
	H. B. Adair	do	115.40
	P. I. Kershner	do	115.40
	Thos. A. Bray	do	115.40
	A. R. Wake	do	115.40
	A. M. Rork	do	115.40
	A. J. Pistor	do	98.90
	C. H. Bugbee	do	98.90
	Chas. A. Stevens	do	115.40
	G. W. Butler	do	98.90
	R. A. Ramsay	do	98.90
	Western Union Telegraph Co	Services	21.81
	do	do	27.23
9	Jno. Forbes et al	Salaries	2,488.37
	Louis K. Green et al	do	180.70
	Louis K. Green	Traveling expenses	5.15
	do	do	1.75
	W. C. Barth	Office expenses	2.60
	W. C. Barth et al	Salaries	512.70
	T. A. Shipley et al	do	323.10
	A. E. Behnke et al	do	1,147.40
	Frank D. Ketchum et al	do	807.14
	Ira K. Atherton et al	do	180.40
	Boyd Baldwin et al	do	614.80
	L. Enos Day et al	do	174.70
	Joshua Miller et al	do	248.90
	J. C. Milnes et al	do	115.40
	J. C. Milnes	Traveling expenses	4.00
	Geo. Ditewig et al	Salaries	263.80
	W. S. Devoe	Services	164.80
	Clarence Loveberry et al	Salaries	173.10
	O. B. Hess et al	do	174.70
	E. T. Davison	Services	98.90
	Chas. Cowie	do	112.00
	H. T. Potter	Traveling expenses	7.00
	H. D. Mayne	do	27.67
	W. H. Rose	Office expenses	29.70
	Tooie A. Geddes	Services	164.80
	G. W. Ward	do	115.40
	Wm. T. Mayer	Chair	5.75
	Fred. W. Keisker & Son	Desk	22.50
	Per Ehrenheim	Rent	30.00
	Saml. E. Cosford	Use horse and buggy	20.00
	St. Louis National Stock Yards	Rent	50.00
	W. S. Cass	Office expenses	2.00
	do	Horse feed	10.00
	Albert E. Behnke	Use of horse and buggy	35.00
	F. D. Ketchum	do	20.00
	A. A. Holcombe	Traveling expenses	48.47
	R. A. Ramsay	do	21.25
	A. J. Pistor	do	8.85
	A. Bauman, jr	Use horse and buggy	20.00
	Robt. H. Treacy	Services	98.90
	do	Traveling expenses	47.00
	R. J. Blanche	do	5.20
	Geo. E. Totten	do	21.30
	B. L. Stine	Office expenses	11.15
	do	do	7.45
	B. W. Murphy, jr	Traveling expenses	11.40
	Chas. Keane	Office expenses	5.00

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

BUREAU OF ANIMAL INDUSTRY—SALARIES AND EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
May. 9	Henry Singleton	Traveling expenses	$11.80
	O. W. Snyder	do	18.55
	E. N. Hutchinson	Office expenses	11.50
	The United States Express Co	Freight	3.38
10	O. E. Dyson et al	Salaries	8,127.55
	A. G. G. Richardson	Office expenses	6.31
11	Morris Wooden et al	Salaries	5,922.63
	E. W. Barthold et al	do	1,593.23
	Benj. S. Paddock et al	do	233.10
	Herman Busman et al	do	850.40
	H. P. Armsby et al	do	176.30
	Frank E. Emery	Services	265.32
	The Franklin County Creamery Association	Butter	201.76
	Saml. E. Cosford	Salary	115.40
	W. H. Gibbs et al	Salaries	158.20
	R. W. Tuck et al	do	410.03
	Wm. Thompson et al	do	1,078.00
	J. J. Brougham et al	do	2,093.20
	Henry E. Alvord	Traveling expenses	76.10
	D. E. Salmon	do	23.05
13	T. S. Buck	Patent flexible mounts	37.20
	Chas. Cowie	Traveling expenses	18.25
	C. L. Morin	do	5.55
	E. J. Maloy	Bicycle, etc	25.00
	Wm. Lochte	Shoeing horses	14.87
	Mackall Bros	Supplies	144.67
	do	do	.53
	Chas. Keane et al	Salaries	382.40
	do	Use horse and buggy	25.00
	Robt. Darling	Salary	115.40
	E. N. Hutchinson et al	Salaries	282.00
	Frank E. Eells	Services	115.40
	do	Traveling expenses	5.00
	Wm. E. Howe	Services	98.90
	Geo. S. Baker et al	Salaries	413.80
	J. O. Jacobs	Services	98.90
	Hugh M. Rowe	do	98.90
	Jno. McBirney	do	131.90
	do	Traveling expenses	113.00
	Levi P. Beechy	Services	98.90
	do	Traveling expenses	2.00
	Lowell Clarke	Services	115.40
	C. H. Bugbee	Traveling expenses	98.80
14	Mary A. Atwood et al	Salaries	451.56
	Don C. Ayer et al	do	4,325.21
	W. H. Wray	Services	375.00
	do	Traveling expenses	15.13
	do	do	17.04
	do	Office expenses	17.98
	do	do	5.91
	J. F. Ryder	Traveling expenses	47.67
	Caroline Burnaby	Services	40.00
	Jas. W. Davis	Use horse and buggy	18.00
	Don C. Ayer	do	15.00
	J. F. Ryder	Services	164.80
16	United States Electric Lighting Co	Electric current	18.87
	Richard L. Lamb	Pads	18.10
	American Ice Co	Ice	16.35
	The Chesapeake and Potomac Telephone Co.	Telephone service	2.50
	M. Du Perow	Batteries, etc	11.00
	W. M. Galt & Co	Feed for animals	303.35
	D. Frank Parker	Typewriter table, etc	9.60
	Louise Brereton	Traveling expenses	12.00
	F. L. Russell	Services	48.00
	do	Traveling expenses	8.35
	Nathan K. Fegley	Office expenses	.50
	H. T. Potter	Services	27.00
17	Chas. M. Day	Calf	50.00
	O. E. Dyson	Use of saddle horse	15.00
	Waterbury Clock Co	Clock	11.76
	Fort Wayne Coal Co	Coal	6.50
	Illinois Wringer Co	Wringer	3.50
	Hibbard, Spencer, Bartlett & Co	Clippers	5.28
	S. W. Burt	Use saddle horse	15.00
	A. P. Little	Mimeograph ink	2.25
	Hiram W. Hawley	Use of horse and wagon	39.00
	do	Use of horse and buggy	23.00
	M. S. Lantz	Traveling expenses	18.74
	J. O. Jacobs	do	13.90

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

BUREAU OF ANIMAL INDUSTRY—SALARIES AND EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
May 17	Chas. H. Stevens	Traveling expenses	$71.20
	Ernest N. Hutchinson	Office expenses	11.00
	Frank Parker	Services	98.90
	Frank Parker	Traveling expenses	67.00
	L. Berger	Hauling	2.60
	Hugh M. Rowe	Traveling expenses	50.35
	Lowell Clarke	do	61.25
	W. E. Howe	do	55.50
	Dan. McCunningham	do	57.20
	Geo. C. Moser	do	63.80
	Geo. W. Browning	do	25.15
	Thos. A. Bray	do	10.50
	Hanford-Hazelwood Creamery Co	Butter	138.07
	Springbrook Creamery Co	do	98.67
	Louis K. Green	Office expenses	.40
	Wm. C. Honan	Traveling expenses	19.75
	Robt. H. Treacy	do	41.25
	W. S. Devoe	do	68.77
	R. G. Merrill	do	2.54
	Jos. M. Good	do	3.00
	do	Office expenses	2.50
	Arthur M. Rork	Traveling expenses	40.36
	Boyd Baldwin	Office expenses	5.42
	E. T. Davison	Traveling expenses	21.75
	W. B. Niles	do	9.95
	do	Office expenses	70.02
	Saml. E. Cosford	Traveling expenses	16.23
	Arthur R. Wake	do	8.45
	do	do	16.70
	Rudolph, West & Co	Hardware	217.72
	Thos. Somerville & Sons	Enameled bath tub	27.30
	A. D. Melvin	Traveling expenses	210.80
20	Miller Lock Co	Keys, etc	1.66
	Geo. Meier & Co	Lithographic stones	128.35
	Dennison Manufacturing Co	Tags	176.00
	do	Checks	32.00
	do	Tags	21.00
	do	do	7.00
	do	do	2.35
	J. H. Bunnell & Co	Supplies	4.48
	A. G. G. Richardson	Use of horse and buggy	38.00
	Jno. R. Mohler	Traveling expenses	3.00
	S. E. Bennett	Use of horse and buggy	23.00
21	Houghton & Delano	Supplies	7.51
23	Cincinnati Union Stock Yard Co	Rent	26.50
	Goes Lithographing Co	Meat inspection stamps	580.64
	W. L. Van Duzor	Cattle	80.00
	O. E. Dyson	Office expenses	8.45
	Monroe B. Miller	Traveling expenses	14.60
	Jos. W. Parker	do	25.75
	R. P. Steddom	do	14.67
	Geo. S. Baker	do	5.30
	Clarence Loveberry	Office expenses	1.35
	Martha A. Brittan	Traveling expenses	11.60
	Mary Connolly	do	13.05
	Martha Schnell	do	10.95
	E. N. Hutchinson	do	5.25
	W. D. Jorden	do	84.30
	L. J. Allen	do	31.05
	Chas. A. Brown	do	50.60
	Thos. Castor	do	120.90
	Peter I. Kershner	do	39.34
	Harry D. Paxson	do	7.35
	W. E. Hill	do	6.00
	Louis Metsker	do	20.50
	Chas. Pearson	do	2.05
24	J. E. R. Carpenter	Office rent	26.25
	Emma J. Adams, administratrix	do	120.00
	F. M. Perry	Traveling expenses	14.50
	Tooie A. Geddes	Office expenses	21.47
	F. W. Ainsworth	do	2.75
	Julius Huelsen	do	11.05
	M. S. Lantz	Services	98.90
	Jno. S. Martin & Co	Cheese	8.14
	Rosemary Creamery Co	Butter	181.72
	The Baker & Adamson Chemical Co	Asbestos	3.20
	Maine Condensed Milk Co	Milk	20.40
	The Peterson Parchment Paper Co	Parchment paper	2.00
	Benj. H. Shoemaker	Glass	24.00
	Eimer & Amend	Water baths	24.00

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

BUREAU OF ANIMAL INDUSTRY—SALARIES AND EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
May 24	Tyer Rubber Co	Rubber tips	$18.00
	Library Bureau	Cards, etc	106.23
25	S. R. Burch	Traveling expenses	17.75
27	Eugene Tilden	Sign markers	10.00
	Robt. Burrows	Sand	23.00
	Church & Stephenson	Lumber	58.25
	Geo. E. Howard	Drawings	100.00
	The McDermott Carriage Co	Buggy	180.00
	Geo. F. Muth & Co	Printers' supplies	122.00
	Jas. B. Lambie	Nails	56.90
	do	Iron	2.50
	The Chesapeake and Ohio Rwy. Co	Passenger transportation	27.00
	Chicago, Burlington and Quincy R. R. Co	do	24.75
	The Oregon R. R. and Navigation Co	do	11.20
	Chicago, Milwaukee and St. Paul Rwy. Co	do	20.80
	Northern Pacific Rwy. Co	do	11.50
	Burlington and Missouri River R. R. in Nebr.	do	28.92
	Atlanta, Knoxville and Northern Rwy. Co	do	4.14
	The Cleveland, Cincinnati, Chicago and St. Louis Rwy. Co.	do	64.00
	Galveston, Harrisburg and San Antonio Rwy. Co.	do	48.70
	International and Great Northern R. R. Co	do	4.60
	Pennsylvania R. R Co	do	.35
	Hannibal and St. Joseph R. R. Co	do	1.94
	Boston and Albany R. R. Co	do	11.29
	Lake Shore and Michigan Southern Rwy. Co.	do	.68
	The Atchison, Topeka and Santa Fe Rwy. Co.	do	23.12
	Star Union Line	do	.62
	do	do	.77
	New York, Chicago and St. Louis R. R. Co	do	1.17
	Lake Shore and Michigan Southern Rwy. Co.	do	.45
	Chicago, Milwaukee and St. Paul Rwy. Co	do	4.69
	Chicago, Rock Island and Pacific Rwy. Co	do	1.58
	do	do	.99
	Chicago and Northwestern Rwy. Co	do	3.92
28	The J. C. Ergood Co	Sapolio	2.25
	The Geo. W. Knox Express Co	Transportation	1.25
	A. E. de Schweinitz	Office expenses	37.44
	Rudolph, West & Co	Chamois skins, etc	44.17
	Jas. D. Topham	Extension case	1.15
	Lutz & Co	Curry hoof pads	25.80
	Helen H. Brooke, executrix	Hay cutter	30.00
	Fred. A. Schmidt	Pencils	1.10
	Helen H. Brooke, executrix	Grindstone, etc	7.25
	Western Union Telegraph Co	Services	11.52
	do	do	5.41
	do	do	17.69
	do	do	11.35
	do	do	18.57
29	Geo. W. Hill	Traveling expenses	24.00
	G. W. Ward	do	13.45
31	Marion Dorset et al	Salaries	3,939.61
June 3	Wm. Krafft	Microscope, etc	107.90
	M. J. Myers	Traveling expenses	52.20
	Clara E. Townsend	do	7.75
	W. H. Beck	Fire extinguishers, etc	186.00
	A. Wilson & Bro	Feed	1,787.27
4	Southern California Rwy Co	Passenger transportation	10.00
	Union Pacific R. R. Co	do	28.33
	Chicago, Rock Island and Pacific Rwy. Co	do	13.30
	Pennsylvania R. R. Co	do	80.00
	The Missouri Pacific Rwy. Co	do	17.20
	Pittsburg, Cincinnati, Chicago and St. Louis Rwy. Co.	do	14.00
	Pere Marquette R. R. Co	do	6.90
	Washington Gaslight Co	Gas	39.70
5	Geo. S. Hickox	Traveling expenses	38.73
6	M. B. Niles et al	Salaries	550.90
	M. H. Rose et al	do	1,011.50
	C. A. Schaufler et al	do	985.60
	H. A. Hedrick et al	do	484.00
	H. J. Washburn	Services	102.20
	H. N. Waller et al	Salaries	2,787.43
7	W. J. Murphy et al	do	180.60
	Julius Huelsen et al	do	679.80

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

BUREAU OF ANIMAL INDUSTRY—SALARIES AND EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
June 7	Saml. J. Hendren	Services	$119.20
	E. L. Volgenau	do	119.20
	C. L. Morin	do	96.00
	H. D. Mayne	do	102.20
	Jno. A. Bell	do	32.00
	H. T. Potter	do	8.00
	Fredk. Braginton, et al	Salaries	180.60
	W. H. Gibbs et al	do	163.60
	Saml. E. Cosford et al	do	180.60
	Joshua Miller et al	do	296.76
	T. A. Shipley et al	do	353.80
	J. C. Milnes et al	do	123.62
	Frank D. Ketchum et al	do	875.60
	E. P. Schaffter et al	do	556.18
	Boyd Baldwin et al	do	635.40
	Albert Dean et al	do	602.07
	R. J. Blanche	Services	119.20
	H. D. Parson	do	119.20
	L. J. Allen	do	119.20
	F. T. Shannon	do	119.20
	H. B. Adair	do	119.20
	Thos. A. Bray	do	119.20
	P. I. Kershner	do	119.20
	Thos. Castor	do	119.20
	Geo. W. Browning	do	102.20
	Dan McCunningham	do	102.20
	Jos. W. Parker	do	102.20
	Geo. E. Totten	do	102.20
	W. E. Hill	do	102.20
	Louis Metsker	do	102.20
	B. W. Murphy, jr	do	102.20
	Wm. D. Jorden	do	102.20
	Geo. C. Mosher	do	102.20
	M. B. Miller	do	102.20
	W. J. Shaw	do	102.20
	H. L. McDonald	do	76.60
	A. M. Rork	do	73.08
8	Geo. C. Faville et al	Salaries	282.80
	H. P. Armsby et al	do	182.40
	Edw. P. Dowd et al	do	180.60
	N. K. Fegley et al	do	180.60
	F. W. Huntington et al	do	154.20
	F. W. Ainsworth et al	do	431.60
	Ira K. Atherton et al	do	184.20
	Jos. M. Good et al	do	163.60
	M. O. Anderson	Services	119.20
	James Irwin	do	85.20
	R. A. Ramsay	do	102.20
	A. J. Pistor	do	102.20
	A. A. Holcombe	do	119.20
	Geo. S. Hickox	do	102.20
	W. B. Lincoln	do	119.20
	D. Cumming	do	60.00
	R. P. Steddom et al	Salaries	207.80
	F. W. Hopkins	Services	119.20
	F. T. Dolan	do	119.20
	M. J. Myers	do	102.20
	W. P. Ellenberger	do	102.20
	Jas. M. Turner	do	76.60
	W. M. Foster	do	61.40
	A. J. Payne et al	Salaries	1,079.10
	W. S. Cass et al	do	1,194.20
	Jno. Forbes et al	do	2,668.67
	Geo. L. McKay	Services	200.00
10	Don C. Ayer et al	Salaries	4,134.89
	Lewis R. Baker et al	do	918.60
	T. J. Turner et al	do	850.06
	N. C. Sorensen et al	do	1,755.69
	Wm. Thompson et al	do	1,100.81
	A. E. Behnke et al	do	1,180.72
	Clarence Loveberry et al	do	178.80
	Clarence Loveberry	Office expenses	2.10
	Jas. S. Kelly et al	Salaries	257.20
	L. K. Green et al	do	186.60
	Chas. H. Stevens	Services	73.08
	E. C. Schroeder	Office expenses	6.35
11	J. J. Brougham et al	Salaries	2,153.71
	Rice P. Steddom	Office expenses	7.50
	Chas. E. Steel	Traveling expenses	9.05
	Geo. Jobson	do	38.60

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd

BUREAU OF ANIMAL INDUSTRY—SALARIES AND EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
June 11	A. E. Behnke	Use horse	$35.00
	W. R. Dennis	Traveling expenses	10.50
	Chas. M. Day	do	25.40
	do	Office expenses	12.00
	J. C. Milnes	do	2.55
	W. A. Savage	Traveling expenses	18.50
	A. J. Pistor	do	8.90
	W. B. Niles	do	14.25
	Samuel E. Cosford	Use horse	20.00
	Albert Lea Dairy Association	Butter	56.98
	A. Bauman	Use horse and buggy	20.00
	Geo. W. Butler	do	30.00
12	E. W. Barthold et al	Salaries	1,614.20
	Morris Wooden et al	do	6,303.31
	Jas. Johnson et al	do	1,498.07
	A. G. G. Richardson et al	do	851.30
	C. H. Zink et al	do	1,858.09
	C. L. Morin	Traveling expenses	6.25
	H. D. Mayne	do	23.12
	H. T. Potter	do	2.75
	G. W. Ward	Services	119.20
	do	Traveling expenses	17.00
	Chas. Cowie	do	23.65
	F. M. Perry	Services	119.20
	do	Traveling expenses	27.30
	Church & Stephenson	Lumber	1,243.97
	do	do	645.44
13	O. E. Dyson et al	Salaries	8,172.37
	Herman Busman et al	do	1,120.00
	M. S. Lantz	Services	102.20
	Frank Parker	do	102.20
	J. Otis Jacobs	do	119.20
	W. S. Devoe	do	170.40
	Geo. W. Butler	do	102.20
	Levi P. Beechy	do	102.20
	C. H. Bugbee	do	102.20
	A. P. Morse	do	119.20
	R. H. Treacy	do	102.20
	Hugh M. Rowe	do	102.20
	Jno. F. Deadman	do	45.00
	Jno. McBirney	do	136.20
	David C. Hanawalt	do	102.20
	W. E. Howe	do	119.20
	Lowell Clarke	do	119.20
	Frank C. Eells	do	65.38
	F. T. Suit	do	29.67
	S. E. Bennett et al	Salaries	6,136.55
	A. R. Wake et al	do	1,092.57
	L. Enos Day et al	do	180.60
	W. J. Stewart et al	do	863.40
	N. C. Sorensen et al	do	426.12
	Geo. Ditewig et al	do	272.40
	W. C. Barth et al	do	529.60
	Ernest Betz	Repairing ice box	4.50
	Thos. Somerville & Sons	Sheet lead, etc	31.15
14	O. B. Hess et al	Salaries	180.60
	Robt. Darling et al	do	119.20
	Chas. Keane et al	do	456.60
	E. N. Hutchinson et al	do	296.00
	Geo. S. Baker et al	do	427.40
	do	Traveling expenses	5.00
	Wm. C. Honan	do	20.50
	Elias Gilmore	do	9.25
	A. A. Holcombe	do	45.70
	R. A. Ramsay	do	32.28
	A. B. Morse	do	7.30
	M. S. Lantz	do	46.75
	Lowell Clarke	do	57.50
	D. R. Hodges	do	59.20
	Frank Parker	do	87.50
	Murray J. Myers	do	69.40
	F. W. Hopkins	do	11.75
	Fredk. T. Dolan	do	15.50
	Wm. G. Shaw	do	78.30
	Robt. H. Treacy	do	44.70
	National Electric Supply Co	Supplies	.36
	The Chesapeake and Potomac Telephone Co.	Moving telephone	.75
	Eimer & Amend	Supplies	447.64
	do	do	40.04

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

BUREAU OF ANIMAL INDUSTRY—SALARIES AND EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
June 14	United States Envelope Co	Envelopes	$157.00
	Henry J. Washburn	Traveling expenses	3.75
15	R. Carter Ballantyne	Sponge cup, etc	1.50
	Mackall Bros	Supplies	179.59
	Rudolph, West & Co	Hardware	91.51
	Wyckoff, Seamans & Benedict	Repairs to typewriters	13.00
	Z. D. Gilman	Supplies	112.23
	do	Thermometers, etc	89.80
	A. Wilson & Bro	Goats	10.00
	W. M. Galt & Co	Feed for animals	603.35
17	Roy N. Drake	Traveling expenses	23.85
	Harry D. Paxson	do	10.30
	Frank T. Shannon	do	21.30
	Thos. A. Bray	do	9.75
	Geo. E. Totten	do	6.60
	A. C. Hart	do	5.50
	W. E. Hill	do	1.00
	Hugh Reilly	Glass	31.59
	G. W. Marshe	Services	2.75
	Smith & Pomeroy	do	85.40
	Rice P. Steddom	Traveling expenses	66.26
	Wm. E. Pratt	Hog ringers, etc	6.19
	Goes Lithographing Co	Meat inspecting stamps	581.33
18	Tooie A. Geddes	Services	170.40
	Mittag & Volger	Carbon paper	9.60
	Eimer & Amend	Supplies	15.05
	do	Tripods	1.20
	Bausch & Lomb Optical Co	Tubes	314.43
	Electro-Tint Engraving Co	Illustrations	330.00
	The Chesapeake Electric Co	Supplies	1.50
	Whitall, Tatum & Co	Flasks	40.39
	do	Supplies	5.13
	Dennison Manufacturing Co	do	10.50
	do	Tags	11.75
	Eberhard Faber	Bands	41.76
	American Ice Co	Ice	19.61
	The Standard Brick Co	Paving brick	130.00
	Chas. Becker	Oil	12.00
	Wm. Lochte	Shoeing horses, etc	13.10
	Henry E. Alvord	Traveling expenses	33.60
	D. E. Salmon	do	40.30
	E. A. de Schweinitz	Office expenses	27.85
	G. E. Patrick	Traveling expenses	2.92
19	A. H. Richards	do	15.90
	Hanford-Hazlewood Cream Co	Butter	31.20
	C. E. Udell & Co	Cheese	22.64
	Chicago Car Seal and Manufacturing Co	Crimped wire and tags	64.97
	do	Tags	3.33
	A. P. Little	Paper, ink, etc	5.25
	Saml. Chamberlain	Stallion	20.00
	Chas. W. Denton	Horse	25.00
	Wm. Shannon	Horses	70.00
	B. W. Murphy, jr	Traveling expenses	30.25
	Monroe B. Miller	do	35.35
	Dan McCunningham	do	25.25
	Jos. W. Parker	do	22.75
	Chas. A. Brown	do	53.05
	Peter I. Kershner	do	31.41
	L. J. Allen	do	36.50
	W. E. Howe	do	39.00
	C. M. McFarland	do	41.15
	W. B. Moses & Sons	Furniture	70.00
	Chas. R. Edmonston	Pans	5.05
	United Typewriter and Supplies Co	Typewriters	390.00
	Thos. Somerville & Sons	Cement, etc	117.43
	A. Wilson & Bro	Cows	57.50
	Jas. B. Lambie	Chain, etc	26.37
	do	Hardware	12.76
20	St. Louis National Stock Yards	Rent	50.00
	F. D. Ketchum	Use horse and buggy	20.00
	Chas. Keane	do	25.00
	Per Ehrenheim	Rent	30.00
	S. E. Bennett	Use horse	23.00
	Jas. W. Davis	Use horse and buggy	18.00
	Jos. M. Good	Traveling expenses	2.75
	do	Office expenses	.55
	Boyd Baldwin	do	5.12
	Don C. Ayer	do	1.70
	Jno. McBirney	Traveling expenses	116.50

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

BUREAU OF ANIMAL INDUSTRY—SALARIES AND EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
June 20	Wm. D. Jorden	Traveling expenses	$54.36
	Geo. C. Moser	do	65.50
	Thos. Castor	do	138.70
	W. H. Wray	Services	387.50
	do	Traveling expenses	17.48
	do	Office expenses	4.47
	Caroline Burnaby	Services	40.00
	J. F. Ryder	do	170.40
	do	Traveling expenses	47.67
	A. F. Martins	do	18.15
	W. H. Rose	Office expenses	26.90
	Tooie A. Geddes	Traveling expenses	63.02
	Chas. Cowie	Services	136.00
	Rosemary Creamery Co	Butter	162.40
	Julius Huelson	Office expenses	4.80
	A. G. G. Richardson	do	6.62
	O. E. Dyson	Use saddle horse	15.00
	do	Office expenses	7.60
	O. G. Atherton	Traveling expenses	24.65
	S. W. Burt	Use saddle horse	15.00
	H. W. Hawley	Use horse and wagon	39.00
	do	Use horse and buggy	23.00
	Frisby T. Suit	Traveling expenses	25.75
	D. C. Hanawalt	do	69.65
	Saml. E Cosford	do	18.22
	Wm. P. Ellenberger	do	46.49
	Geo. S. Hickox	do	75.70
	W. S. Cass	Office expenses	2.00
	do	Horse feed	10.00
	S. W. Burch	Traveling expenses	37.90
21	C. N. Stevens	Calf	15.00
	Don C. Ayer	Use horse	15.00
	A. G. G. Richardson	Use horse and buggy	38.00
	Occidental and Oriental	Freight	20.10
	F. H. Lovell & Co	Time-detector clocks	39.00
	Geo. P. Hall & Son	Photographs	4.80
	Wm. Kraft	Microscope stand	188.25
	Pearre E. Crowl Co	Type	26.00
	J. T. Woodhouse	Plow, etc	12.95
	Library Bureau	Cardcase	47.75
	Western Union Telegraph Co	Telegraph service	20.05
	do	do	14.10
	do	do	11.02
22	W. R. Fleming	Traveling expenses	15.45
	Louis Metsker	do	6.25
	C. N. Bugbee	do	71.25
	Edw. S. Schmidt	Prepared feed	14.00
	Ernst Betz	Repairing skylight	12.00
	R. A. Pearson	Butter	4.50
24	Eimer & Amend	Supplies	5.80
	R. A. Pearson	Traveling expenses	50.44
	A. Wilson & Bro	Forage	1,846.03
	W. B. Moses & Sons	Furniture	103.45
	The Geo. W. Knox Express Co	Drayage	12.00
	E. N. Hutchinson	Traveling expenses	17.25
	J. M. Sommer	do	10.85
	Frank B. McCall	do	18.00
	E. T. Davison	Services	102.20
	Chicago Car Seal and Manufacturing Co	Lead disks, tags, etc	268.90
25	Galveston, Harrisburg and San Antonio Rwy. Co.	Passenger transportation	5.10
	Chicago, Rock Island and Pacific Rwy. Co	Transportation	2.86
	Harry E. Overstreet	do	.12
	do	do	.56
	do	do	1.71
	do	do	.62
	Pennsylvania Co	do	.45
	Chicago, Indianapolis and Louisville Rwy. Co.	do	4.14
	Missouri Pacific Rwy. Co	do	.37
	Erie R. R. Co	do	2.60
	Cleveland, Cincinnati, Chicago and St. Louis Rwy. Co.	do	.83
	Chicago, Milwaukee and St. Paul Rwy. Co	do	.42
	do	do	1.58
	Burlington and Missouri River R. R. in Nebraska.	do	.63
	Star Union Line	do	.92
	Illinois Central R. R. Co	do	.21
	Louisville and Nashville R. R. Co	do	.55

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

BUREAU OF ANIMAL INDUSTRY—SALARIES AND EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
June 25	Illinois Central R. R. Co	Transportation	$1.59
	do	do	2.12
	W. S. Devoe	Traveling expenses	75.80
	E. N. Hutchinson	Office expenses	18.15
	Margaret Burke	Traveling expenses	20.45
	Fremont, Elkhorn and Missouri Valley R. R. Co.	Passenger transportation	3.14
	The Oregon Railroad and Navigation Co	do	11.20
	The Chicago, Burlington and Quincy R. R. Co.	do	3.82
	The Rio Grande and Western Rwy. Co	do	22.40
	Oregon Short Line R. R. Co	do	23.30
	Gulf, Colorado and Santa Fe Rwy. Co	do	8.25
	Nashville, Chattanooga and St. Louis Rwy. Co.	do	3.51
	The Atchison, Topeka and Santa Fe Rwy. Co.	do	8.15
	Savannah, Florida and Western Rwy. Co	do	6.40
27	L. S. Ropiequet	Traveling expenses	2.27
	W. R. Dennis	do	12.50
	Washington Gaslight Co	Gas	38.00
	United States Electric Lighting Co	Electric current	18.80
	Irvine Frickey	Traveling expenses	7.55
	Hugh Reilly	Zinc	22.50
	United States Express Co	Transportation	14.33
29	Marion Dorset et al	Salaries	4,236.84
	Jas. K. Kerr, jr	Services	87.50
	Total, fourth quarter		250,740.54
	Supplemental.		
July 2	W. H. Thomas	Services	41.21
	E. A. de Schweinitz	Traveling expenses	88.85
	R. W. Hickman	do	9.30
	S. R. Burch	do	20.73
	Edw. B. Markham	Hogs	182.40
	Wm. Lockte	Repairs to wagon	9.00
	A. Wilson & Bro	Cows	60.00
	Mackall Bros	Corks, etc	63.00
	T. W. Brown	Window screens, etc	4.50
	Parrish-Erickson Hardware Co	Water cooler, etc	5.00
	Goode & Esden	Spray pumps	49.84
	M. R. Calkins	Pigs	46.00
	Toyo Kisen Kaisha	Freight	39.20
5	F. W. Huntington et al	Salaries	148.90
	Nathan K. Fegley et al	do	174.70
	H. A. Hedrick et al	do	468.00
	W. H. Rose et al	do	1,017.04
	Julius Huelsen et al	do	657.60
	A. G. G. Richardson et al	do	841.60
	Jas. Johnston et al	do	1,501.50
	Joshua Miller et al	do	245.04
	R. P. Steddom et al	do	201.10
	Fredk. Braginton et al	do	174.70
	A. E. Behnke et al	do	1,088.10
	E. P. Shaffter et al	do	538.70
	G. H. Parks	Services	115.40
	E. L. Volgenau	do	115.40
	H. D. Mayne	do	98.90
	W. P. Ellenberger	do	98.90
	F. W. Hopkins	do	115.40
	Joseph M. Turner	do	74.20
	W. M. Foster	do	59.30
	H. J. Washburn	do	107.14
	Asa N. McQueen	do	20.00
	F. T. Dolan	do	115.40
	Murray J. Myers	do	98.90
	T. S. Buck	Special patented flexible mounts	8.25
	Adams Express Co	Transportation	56.26
6	M. B. Miller	Services	72.53
	H. L. McDonald	do	74.20
	Harry D. Paxson	do	92.31
	Wm. D. Jorden	do	98.90
	Jos. W. Parker	do	98.90
	A. C. Hart	do	98.90
	Dan McCunningham	do	98.90
	Wm. G. Shaw	do	98.90
	Geo. E. Totten	do	98.90
	Geo. W. Browning	do	98.90

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

BUREAU OF ANIMAL INDUSTRY—SALARIES AND EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
	Supplemental—Continued.		
1901.			
July 6	Harry B. Adair	Services	$115.40
	P. I. Kershner	do	115.40
	Frank T. Shannon	do	115.40
	R. J. Blanche	do	115.40
	L. J. Allen	do	115.40
	Thos. Castor	do	115.40
	Thos. A. Bray	do	115.40
	Frank E. Emery	do	350.00
	Albert Dean et al	Salaries	751.60
	The American Distributing Co	Alcohol	22.92
	Miller Lock Co	Padlocks, etc	35.00
	Kehoe Livery and Trucking Co	Wagon, etc	120.00
	Johnson Electric Service Co	Mechanical stages	192.00
	E. B. Jones	Traveling expenses	83.05
8	Eimer & Amend	Mufflers, etc	6.00
	C. L. Morin	Services	44.00
	W. A. Thomas	do	123.60
	A. A. Holcombe	do	115.40
	Louis Metsker	do	98.90
	R. A. Ramsay	do	98.90
	Robt. H. Treacy	do	98.90
	Jas. Irwin	do	82.40
	H. C. Johnson	do	27.69
	Geo. C. Faville et al	Salaries	273.60
	Alfred F. Martins et al	do	407.17
	L. R. Baker et al	do	891.70
	W. J. Stewart et al	do	817.59
	W. B. Niles et al	do	660.80
	George Ditewig et al	do	263.80
	Jas. S. Kelly et al	do	248.90
9	Houghton & Delano	Materials	147.00
	L. S. Depue	Oats	19.80
	Wm. H. Rupp, agent	Envelopes	21.25
	Wagner Typewriter Co	Typewriter	89.25
	Hugh Reilly	Glass	13.68
	do	Glue	7.50
	Fred A. Schmidt	Blue paper,	2.70
	Bausch & Lomb Optical Co	Cylinders	222.59
	Star Union Line	Transportation	16.77
	do	do	.74
	do	do	4.66
	New York, New Haven and Hartford R. R. Co.	do	1.21
	Burlington and Missouri River R. R. in Nebraska.	do	3.44
	Lake Shore and Michigan Southern Rwy. Co.	do	.45
	Grand Trunk Rwy. System	do	.37
	Pennsylvania Co	do	3.51
	do	do	.67
	Illinois Central R. R. Co	do	2.94
	Lehigh Valley R. R. Co	do	.75
	Pennsylvania R. R. Co	Passenger transportation	45.00
	Michigan Central R. R. Co	Transportation	.72
	Cleveland, Cincinnati, Chicago and St. Louis Rwy. Co.	do	.34
	Chicago, Burlington and Quincy R. R. Co	do	.57
	do	do	1.71
	Missouri Pacific Rwy. Co	do	.68
	Union Pacific R. R. Co	Passenger transportation	9.14
10	O. E. Dyson et al	Salaries	7,965.64
	Morris Wooden et al	do	6,280.55
	Saml. E. Bennett et al	do	5,828.02
	C. H. Zink et al	do	721.90
	E. P. Dowd et al	do	174.70
	H. P. Armsby et al	do	176.30
	W. J. Murphy et al	do	174.70
	H. N. Waller et al	do	2,569.77
	C. A. Schaufler et al	do	939.57
	A. J. Payne et al	do	842.19
	W. S. Cass et al	do	1,155,40
	H. G. Moore et al	do	1,250.44
	Jas. J. Brougham et al	do	2,002.52
	L. E. Day et al	do	174.70
	Boyd Baldwin et al	do	614.80
	Thos. J. Turner et al	do	822.50
	Jas. M. Goode et al	do	158.20
	Ira K. Atherton et al	do	177.90
	E. W. Barthold et al	do	1,541.80

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

BUREAU OF ANIMAL INDUSTRY—SALARIES AND EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
	Supplemental—Continued.		
1901.			
July 10	Jno. C. Milnes et al	Salaries	$529.20
	Herman Busman et al	do	850.40
	J. K. Skinner et al	do	208.40
	L. K. Green et al	do	234.00
	F. W. Ainsworth et al	do	416.76
	F. L. Russell	Traveling expenses	42.15
	Jno. A. Bell	Services	32.00
	Wm. F. Lavery	do	98.90
	W. B. Lincoln	do	115.40
	W. C. Barth	do	115.40
	Geo. W. Butler	do	98.90
	F. T. Suit	do	98.90
	Clinton H. Bugbee	do	98.90
	D. Frank Parker	Typewriter paper	26.85
	W. B. Moses & Sons	Furniture	394.65
12	J. Otis Jacobs	Traveling expenses	31.15
	W. R. Fleming	do	39.61
	W. G. Shaw	do	96.70
	A. A. Holcombe	do	15.06
	C. P. Staines	do	30.75
	Hugh M. Rowe	do	110.30
	H. G. Moore	do	7.90
	R. M. Mahana	do	6.75
	Clarence Loveberry	do	4.30
	Harry K. Walter	do	6.40
	E. P. Schaffter	do	2.50
	S. E. Bennett	do	9.50
	M. B. Miller	do	7.00
	Harry B. Adair	do	13.85
	Geo. C. Moser	do	27.00
	Thos. Castor	do	40.40
	Geo. E. Totten	do	12.45
	W. B. Niles	do	23.30
	H. D. Mayne	do	18.27
	E. L. Volgenau	do	23.51
	Robt. Darling	Office expenses	.20
	do	do	1.65
	do	do	6.00
	T. J. Shipley et al	Salaries	323.10
	Don C. Ayer et al	do	4,020.11
	R. W. Tuck et al	do	709.66
	F. L. Russell	Services	88.00
	Hervey T. Potter	do	6.00
	Chas. Cowie	do	136.00
	Saml. G. Hendren	do	115.40
	F. M. Perry	do	115.40
	Tooie A. Geddes	do	164.80
	G. W. Ward	do	115.40
	Wm. Yenner	do	74.20
	B. A. Galligan	do	1.37
	Geo. S. Hickox	do	98.90
	E. A. Bundy	do	22.25
	D. C. Hanawalt	do	98.90
	W. E. Howe	do	115.40
	J. Otis Jacobs	do	115.40
	Jno. McBirney	do	131.90
	M. S. Lantz	do	98.90
	D. Cumming	do	70.00
	Frank A. Ewing	do	46.98
	W. R. Dennis	do	74.20
	Jno. H. McNeall	do	52.75
	A. J. Pistor	do	72.53
	M. O. Anderson	do	115.40
	Geneveve Petrie	do	3.30
	Lowell Clarke	do	115.40
	A. B. Morse	do	115.40
	W. S. Devoe	do	164.80
13	F. L. Russell	do	24.00
	David R. Hodges	do	74.20
	Frank Parker	do	98.90
	Thos. Redmond	do	39.56
	Roy N. Drake	do	98.90
	Hugh M. Rowe	do	98.90
	Z. D. Gilman	Supplies	38.33
	Rudolph, West & Co	do	57.90
	do	Hardware	19.80
	Jno. C. Parker	Copyholders, etc	11.15
	Mackall Bros	Laboratory supplies	17.10
	Thos. Somerville & Sons	Pipes, etc	253.92

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

BUREAU OF ANIMAL INDUSTRY—SALARIES AND EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
	Supplemental—Continued.		
1901.			
July 13	Thos. Somerville & Sons	Hydrants, etc	$34.94
	do	Basins, etc	26.25
	Louis A. Robinson et al	Salaries	1,350.35
	Jno. Forbes et al	do	2,461.35
	N. C. Sorensen et al	do	1,666.46
	A. R. Wake et al	do	1,073.79
	Wm. Thompson et al	do	1,012.81
	Frank D. Ketchum et al	do	847.20
	Geo. S. Baker et al	do	413.80
	Chas. Keane et al	do	418.40
	E. N. Hutchinson et al	do	325.60
	Robt. Darling et al	do	273.60
	Frank B. McCall et al	do	115.40
	Saml. E. Cosford et al	do	174.70
	O. B. Hess et al	do	174.70
	W. H. Gibbs et al	do	158.20
	Clarence Loveberry et al	do	158.20
	Thos. Somerville & Sons	Pipe cutter, etc	4.25
	Houghton & Delano	Seed plates, etc	28.77
	The Evening Star Newspaper Co	Advertising	9.30
	The Times Co	do	11.20
16	Bausch & Lomb Optical Co	Camel-hair brushes, etc	60.16
	Electro-Tint Engraving Co	Impressions of chickens	330.00
	E. J. Brooks & Co	Compressor glasses	74.00
	Page Woven Wire Fence Co	Wire fence, etc	811.25
	R. A. Ramsay	Traveling expenses	4.75
	Louis K. Green	do	5.85
	C. H. Bugbee	do	11.75
	E. N. Hutchinson	do	14.60
	Geo. W. Browning	do	5.05
	Frank T. Shannon	do	25.00
	Peter I. Kershner	do	20.50
	Jos. W. Parker	do	21.55
	Louis Metsker	do	52.75
	Wm. D. Jorden	do	102.34
	Wm. C. Honan	do	19.00
	Murray J. Myers	do	31.55
	Geo. S. Hickox	do	36.60
	D. R. Hodges	do	55.85
	H. M. Rowe	do	81.50
	W. A. Thomas	do	23.90
	Chas. M. Day	do	32.10
	A. J. Smith	Services	39.56
	H. A. Christman	do	115.40
	L. P. Beechy	Traveling expenses	6.50
	Walter E. Howe	do	16.75
	R. H. Treacy	do	45.25
	D. C. Hanawalt	do	42.25
	W. A. Savage	do	57.28
	The Washington Post Co	Advertising	11.10
	E. A. de Schweinitz	Office expenses	3.90
	R. A. Pearson	Traveling expenses	68.85
17	L. J. Allen	do	41.45
	W. G. Shaw	do	92.10
	Dan McCunningham	do	73.53
	Jos. M. Good	do	2.35
	F. D. Ketchum	do	18.40
	Edw. A. Bundy	do	46.30
	Louis K. Green	do	3.25
	Saml. E. Cosford	do	11.21
	Don. W. Patton	do	40.19
	J. Otis Jacobs	do	34.50
	Eureka Blotter Bath Co	Copying cloths and baths	34.50
	W. P. Ellenberger	Traveling expenses	57.23
	Matt. S. Lantz	do	47.00
	C. H. Zink	do	5.31
	C. O. Durfee	do	5.20
	B. P. Wende	do	10.70
	L. A. Robinson	do	7.56
	Jas. F. Hughes	do	6.25
	Harry M. Ball	do	6.55
	W. N. D. Bird	do	8.85
	Jno. P. O'Leary	do	8.26
	F. M. Perry	do	31.45
	G. W. Ward	do	34.45
	F. L. Russell	do	13.05
	Church & Stephenson	Lumber	101.15
	Geo. E. Howard	Drawings	50.00
	Wm. Yenner	Traveling expenses	73.95

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

BUREAU OF ANIMAL INDUSTRY—SALARIES AND EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
	Supplemental—Continued.		
1901.			
July 17	R. A. Ramsay	Traveling expenses	$28.40
	Lowell Clarke	do	74.25
	L. A. Klein	Services	52.75
	Claude M. McFarland	do	98.90
	A. J. Smith	Traveling expenses	38.25
	F. T. Suit	do	82.75
18	Sun Printing and Publishing Association	Advertising	36.00
	Pennsylvania R. R. Co	Transportation	.35
	do	do	.35
	do	do	.35
	R. A. Pearson	Traveling expenses	510.63
19	Arthur C. Hart	do	21.60
	A. J. Pistor	do	2.00
	Chas. H. Stevens	do	2.40
	Carrie Ehlers	do	8.00
	Thos. Redmond	do	46.55
	J. F. Ryder	Services	164.80
	do	Traveling expenses	45.00
	Caroline Burnaby	Services	40.00
	W. H. Wray	do	375.00
	do	Traveling expenses	12.91
	Chas. Cowie	do	32.90
	A. D. Melvin	do	39.52
	The Dispatch Co	Advertising	1.97
	United States Envelope Co	Envelopes	11.55
	United States Electric Lighting Co	Electric current	25.11
	Washington Gaslight Co	Gas	29.60
	United States Express Co	Transportation	9.88
	C. W. Stiles	Traveling expenses	45.00
20	Jno. C. Parker	Supplies	315.91
	The Morning Post	Advertising	2.80
	Houston Printing Co	do	3.10
	Fredk. T. Dolan	Traveling expenses	100.28
22	E. C. Schroeder	Office expenses	8.91
	Wyckoff, Seamans & Benedict	Letter paper	10.50
	M. Du Perow	Fans	64.50
	Barber & Ross	Shears	10.00
23	The Beveridge Lumber Co	Lumber	560.00
	Library Bureau	Cards, etc	20.10
	H. A. Hedrick	Office expenses	9.21
	Chas. A. Schaufler	do	3.70
	do	do	36.25
	A. G. G. Richardson	do	14.93
	Jno. A. Bell	Traveling expenses	8.12
	Geo. C. Faville	Office expenses	7.90
	Ephraim Dietrich	do	8.53
	Don C. Ayers	do	2.65
	Chas. Keane	do	2.60
	Jas. S. Kelly	do	.55
	F. D. Ketchum	do	6.34
	Rice P. Steddom	Traveling expenses	5.97
	Ira K. Atherton	Office expenses	2.35
	E. A. de Schweinitz	do	20.10
24	R. A. Pearson	do	7.50
	J. Manz Engraving Co	Engraving	19.00
	O. E. Dyson	Office expenses	12.86
	A. E. Behnke	do	28.99
	Thos. J. Turner	do	18.25
	F. W. Hopkins	Traveling expenses	27.53
	Lewis R. Baker	Office expenses	2.45
	Wm. Thompson	do	12.68
	C. M. Day	do	8.00
	T. A. Shipley	do	9.75
	Hal. Gaylord	Advertising	2.50
	E. N. Hutchinson	Office expenses	17.00
	B. L. Stine	do	13.15
	Tribune Co	Advertising	18.60
25	G. L. McKay	Services	200.00
	Albert Dean	do	8.61
	Frank Parker	Traveling expenses	81.85
	Jno. McBirney	do	118.75
	Thos. White	Services	45.65
	Boyd Baldwin	Office expenses	5.12
	Allen A. Holcombe	do	6.25
	W. S. Cass	do	2.00
	F. W. Ainsworth	do	2.85
	Adelbert Green	Services	32.50
	J. J. Brougham	Office expenses	15.85
	Albert J. Payne	do	16.00

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

BUREAU OF ANIMAL INDUSTRY—SALARIES AND EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
	Supplemental—Continued.		
1901.			
July 25	A. G. G. Richardson	Office expenses	$6.61
	Julius Huelson	do	6.30
	Hiram Jerome	do	7.60
	Nathan K. Fegley	do	1.00
	Harry N. Waller	do	16.80
	W. H. Rose	do	36.65
26	Victor A. Norgaard	Traveling expenses	141.30
	do	Office expenses	18.00
	do	do	14.99
	N. C. Sorensen	do	15.36
	O. B. Hess	Traveling expenses	21.00
	Geo. S. Baker	do	5.60
	do	Office expenses	.45
	Chester Miller	Traveling expenses	32.85
	Frank A. Ewing	do	86.40
	Union Pacific R. R. Co	Passenger transportation	30.00
	The Atchison, Topeka and Santa Fe Rwy. Co.	do	16.60
27	W. B. Niles	Office expenses	97.00
	Geo. E. Marshall & Co	Paper baskets	3.48
	A. P. Little	Paper, etc	4.60
	B. Dufrain	Moving furniture	20.00
	Chicago Telephone Co	Rent	43.75
	A. W. Martin & Co	Rack	3.38
	The Consumers Co	Ice	30.19
	The New Telephone Co	Rent of 2 telephones	20.00
	Frontier Supply Co	Towel supply	11.83
	Chas. Keane	Service	2.10
	W. S. Cass	Feeding horse	10.00
	The Iowa Telephone Co	Service	10.25
	The Layton Co	Heat, light, etc	10.80
29	Z. D. Gilman	Supplies	21.05
	Barber & Ross	Scissors, etc	77.25
	Wm. Lochte	Shoeing horses	13.00
	Wagner Typewriter Co	Typewriter	87.50
	Leo Baum	Reproductiou of pictures	10.50
	C. Deaderick	Office rent	30.00
	Robt. L. McQuat	Desk fan	12.06
	Alex. Williams	Mare	20.00
	O. E. Dyson	Use of saddle horse	15.00
	S. W. Burt	do	15.00
	Office Toilet Supply Co	Towels furnished	151.67
	H. W. Hawley	Use horse and wagon	37.50
	do	Use horse and buggy	23.00
	Saml. E. Bennett	Use saddle horse	23.00
	Wyandotte Gas Co	Gas	2.97
	Armour Packing Co	Telephone service	12.50
	G. W. Tourtellot	Office rent	135.00
	F. B. McCall	Office expenses	2.25
	Louis A. Klein	Traveling expenses	95.81
	W. R. Dennis	do	61.50
	W. A. Savage	Services	115.40
	St. Louis Stock Yards Co	Office rent	135.00
	Chas. Keane	Use horse and buggy	25.00
	Samuel E. Cosford	do	20.00
	G. W. Butler	do	30.00
	Armstrong Laundry	Laundering	3.66
	Belt R. R. and Stock Yard Co	Office rent	30.00
	Paul H. Bequin	Mare	10.00
	A. A. Lamb	Horse	35.00
	Albert E. Behnke	Use of horse and buggy	35.00
	Jno. A. Dixon	2 mares	60.00
	Cooperative Furniture Co	Desk	39.75
	Thos. A. Bray	Use saddle horse	72.00
	Jas. W. Davis	Use horse and buggy	18.00
	Don C. Ayer	Use horse	15.00
	Missouri and Kansas Telephone Co	Rent and service	12.50
30	Jas. B. Lambie	Supplies	15.79
	Bourbon Stock Yards Co	Office rent	30.00
	The Kansas City Stock Yards Co., of Missouri.	do	49.50
	Cutler and Nielson Paint and Color Co	Thinner	2.50
	W. A. Mosley	Wash boiler, etc	1.50
	Emery Bird Thayer Dry Goods Co	Shades, etc	5.03
	Union Stock Yard and Transit Co	Office rent	225.00
	Gahan & Byrne	do	675.00
	Nebraska Telephone Co	Rent	13.50
	A. Bauman, jr	Use horse and buggy	20.00
	Thos. Redmond	Services	30.16

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

BUREAU OF ANIMAL INDUSTRY—SALARIES AND EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
	Supplemental—Continued.		
1901.			
July 30	L. B. Lessert	Mare	$30.00
	F. D. Ketchum	Use horse and buggy	20.00
	do	Office expenses	.90
	J. J. Van Eaton	Office rent	21.00
	St. Louis National Stock Yards	do	50.00
	Per Ehrenheim	do	30.00
	The Fredk. C. Gross & Bros. Co	do	51.00
	The Cincinnati Union Stock Yards Co	do	45.00
31	Geo. C. Faville	Office expenses	11.90
	J. E. R. Carpenter	Office rent	52.50
	W. M. Foster	Office expenses	11.35
	Jno. H. Ackerman	Horse	200.00
	A. G. G. Richardson	Use horse and buggy	38.00
	New England Telephone and Telegraph Co	Service	52.50
	Bay State Clean Towel Co	Towel service	12.78
	Gerald E. Street	Service	24.00
	Jas. M. Codman	Office rent	90.00
	New York Telephone Co	Rent and service	28.07
	Jas. Stikeman	Office rent	125.00
	Chas. A. Schaufler	Keep of horse	60.00
	The Bell Telephone of Philadelphia	Service	40.00
	International Office Toilet Supply Co	Clean towels	4.94
	Bell Telephone Co. of Buffalo	Service	23.28
	East Buffalo Live Stock Exchange Co	Office rent	90.00
	C. H. Zink	Office expenses	.75
	do	Use horse and buggy	120.00
	N. Rufus Gill	Office rent	31.25
	Chesapeake and Potomac Telephone Co	Rent	19.50
	H. Haywood	Manuscript	125.00
	Wm. Krafft	Microscope	83.20
Aug. 2	S. Foter & Co	Butter, etc	370.47
	Jno. H. McNeale	Traveling expenses	50.00
	W. E. Pratt	Hog rings	221.10
	A. M. Rothchild & Co	Cloth	3.60
	Plenty Birds	1 mare	20.00
	Jno. A. Craig	Manuscript	66.00
	Jas. B. Lambie	Files, etc	11.26
	New York Telephone Co	Rent and services	19.05
	Brigham Hoppe & Co	Butter and cheese	75.92
	Dairymen's Union of California	Butter	173.40
	Dodge, Sweeney & Co	Cream	37.50
	Elvin T. Davison	Services	98.90
	Claude McFarland	Traveling expenses	19.90
	Roy N. Drake	do	49.00
	Geo. C. Walker	Water tank	502.92
	Norfolk and Western R. R. Co	Passenger transportation	6.10
	Baltimore and Ohio R. R. Co	do	17.50
	Galveston, Harrisburg and San Antonio Rwy. Co.	do	7.50
	Fort Worth and Denver City Rwy. Co	do	4.30
	Pittsburg, Cincinnati, Chicago and St. Louis Rwy. Co.	do	46.50
	Southern Rwy. Co	do	49.52
	Fremont, Elkhorn and Missouri Valley R. R. Co.	do	2.82
	Boston and Albany R. R. Co	do	2.23
	The Rio Grande Western Rwy. Co	do	42.20
	Illinois Central R. R. Co	do	17.70
	The Pacific Mail Steamship Co	Transportation	39.00
	The Wabash R. R. Co	Passenger transportation	4.29
	Southern Rwy. Co	do	16.55
	do	do	15.20
	R. Carter Ballantyne	Wax, etc	7.75
	Goes Lithographing Co	Meat inspection stamps	616.87
3	J. E. Dunn	Hauling	17.85
	Mackall Bros	Supplies	99.97
5	Wm. G. Shaw	Traveling expenses	60.40
	W. E. Hill	do	28.20
	Joshua Miller	Office expenses	1.25
	Southern California Rwy. Co	Passenger transportation	5.00
	Chicago and Northwestern R. R. Co	do	12.75
	The Chicago, Burlington and Quincy R. R. Co.	do	7.50
	Burlington and Missouri River R. R. in Nebraska.	do	42.65
	New York Central and Hudson River R. R. Co.	do	10.65
	Southern Pacific Co	do	13.30
	Northern Pacific Rwy. Co	do	12.85

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

BUREAU OF ANIMAL INDUSTRY—SALARIES AND EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
	Supplemental—Continued.		
1901.			
Aug. 6	American Tag Co	Tags	$250.00
	International Seal and Lock Co	Seals	200.00
	Thos. W. Smith	Doors, etc	16.89
7	L. Enos Day	Office expenses	.60
8	Fredk. Braginton	do	.60
	E. P. Dowd	do	.20
9	Thos. Somerville & Son	Hydrants	962.48
	do	Supplies	14.61
	Archd. McBride	Traveling expenses	20.90
	American Ice Co	Ice	21.43
10	Wyckoff, Seamans & Benedict	Card cylinder	2.35
12	E. Burgdorf	Hire teams	33.00
	do	do	26.00
	do	do	33.00
	do	do	33.00
	Rudolph, West & Co	Hardware	14.75
	Electro-Tint Engraving Co	Prints of chicken	330.00
	C. L. Morin	Traveling expenses	.75
	The Geo. W. Knox Express Co	Transportation	22.02
16	W. B. Moses & Sons	Linoleum, etc	382.19
	do	Carpet, etc	276.26
	E. E. Laird	Traveling expenses	4.00
	W. C. Barth	do	10.12
	E. T. Davison	do	4.82
17	A. B. Morse	Office expenses	.85
	W. H. Wray	do	37.07
19	Goodyear Rubber Co	Sheeting	5.75
	J. Haberle	Iron boxes	50.00
	Thos. White	Traveling expenses	11.39
	Hugh M. Rowe	Office expenses	1.50
	E. H. Catlin & Co	Tagging hooks	.75
20	Jno Forbes	Office expenses	5.00
	do	Use horse	45.00
	Emil Greiner	Graduates, etc	4.22
21	Tooie A. Geddes	Office expenses	2.62
	The Chesapeake and Potomac Telephone Co.	Rent	123.75
22	Bausch & Lamb Optical Co	Office expenses	10.36
	Blue Line Transfer Co	Transportation	1.00
	Geo. F. Muth & Co	Turpentine	26.14
23	J. A. Cooper	Use horse	8.00
	A. H. Reid	Butter boxes	12.95
	B. Cunningham	Traveling expenses	5.35
	J. H. Newbauer	Cream	50.05
28	W. B. Moses & Sons	Furniture	40.85
	E. T. Davison	Traveling expenses	45.25
	W. S. Devoe	do	80.25
29	Tooie A. Geddes	do	201.07
	Jno. H. McNeal	do	49.93
	A. M. Rork	do	22.58
	Emma J. Adams, administratrix, et al	Office rent	120.00
30	The J. C. Ergood Co	Soap, etc	17.25
	Barber & Ross	Hasps, etc	8.56
	L. B. Lessrt, jr	Mare	15.00
Sept. 4	W. B. Niles	Office expenses	76.60
	do	do	60.20
	do	do	6.55
	Mackall Bros	Supplies	102.75
	Chas. R. Edmonston	Water coolers, etc	58.48
5	C. R. Wolfenden	Mare	25.00
11	W. D. McArthur	Services	90.00
23	J. C. Milnes	Traveling expenses	12.15
	Frank A. Ewing	Services	27.20
Oct. 2	Burrelles Press Clipping Bureau	Clipping	2.38
	do	do	6.78
4	Illinois Central R. R. Co	Passenger transportation	8.10
	Chicago and Alton Rwy. Co	do	12.50
5	Fremont, Elkhorn and Missouri Valley Rwy. Co.	do	40.36
	The Chicago, Burlington and Quincy R. R. Co.	do	12.50
	do	do	30.00
	Chicago, Milwaukee and St. Paul Rwy. Co	do	23.00
	Chicago, Rock Island and Pacific Rwy. Co	do	38.28
	Oregon Short Line R. R. Co	do	33.80
	New York, New Haven and Hartford R. R. Co.	do	20.75
	Galveston, Harrisburg and San Antonio Rwy. Co.	do	26.55
	do	do	5.10

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

BUREAU OF ANIMAL INDUSTRY—SALARIES AND EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
	Supplemental—Continued.		
1901.			
Oct. 5	The Wabash R. R. Co	Passenger transportation	$14.01
	Chicago and Northwestern Rwy. Co	do	43.97
	Union Pacific R. R. Co	do	60.00
	The Minneapolis and St. Louis R. R. Co	do	12.97
	Southern California Rwy. Co	do	18.50
	Kansas City, Memphis and Birmingham R. R. Co.	do	25.00
	Pennsylvania Co	do	17.50
	Pennsylvania R. R. Co	do	63.50
	do	do	20.00
	Baltimore and Ohio R. R. Co	do	12.75
	Northern Pacific Rwy. Co	do	22.90
11	Chas. R. Edmonston	Water cooler	14.40
	The Geo. W. Knox Express Co	Transportation	1.18
	R. P. Clarke Co	Silk handkerchiefs	9.00
12	Postal Telegraph Cable Co	Service	30.62
14	J. C. Milnes	Office expenses	5.60
	Total supplemental		92,706.65

RECAPITULATION.

First quarter	$148,706.17
Second quarter	234,946.70
Third quarter	236,252.66
Fourth quarter	250,740.54
Supplemental	92,706.65
Total	963,352.72

BUREAU OF ANIMAL INDUSTRY—RENT OF BUILDINGS.

Date.	Name.	Nature of payment.	Total.
1900.			
Aug. 21	J. Harrison Johnson & Son	Rent of building	$150.00
Sept. 24	do	do	150.00
	Total first quarter		300.00
Oct. 25	J. Harrison Johnson & Son	Rent of building	150.00
Dec. 4	do	do	150.00
26	do	do	150.00
	Total second quarter		450.00
1901.			
Jan. 17	J. Harrison Johnson & Son	Rent of building	150.00
Feb. 11	do	do	150.00
Mar. 18	do	do	150.00
	Total third quarter		450.00
Apr. 9	J. Harrison Johnson & Son	Rent of building	150.00
May 10	do	do	150.00
June 11	do	do	150.00
	Total fourth quarter		450.00
	Supplemental.		
Aug. 19	J. Harrison Johnson & Son	Rent of building	150.00
	Total		1,800.00

TREASURY ORDERS.

1900.			
Nov. 4	Union Pacific R. R. Co	Passenger transportation	$109.45
	Fremont, Elkhorn and Missouri Valley R. R. Co.	do	16.90
8	Kansas City, St. Joseph and Council Bluffs R. R. Co.	do	8.66

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

TREASURY ORDERS—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
Jan. 16	Sioux City and Pacific R. R. Co	Passenger transportation	$9.52
Mar. 26	Southern Pacific Co., Pacific System	do	29.50
	do	do	20.00
Apr. 18	do	do	15.00
	Sioux City and Pacific R. R. Co	do	8.66
24	Southern Pacific Co., Pacific System	do	2.06
	Sioux City and Pacific R. R. Co	do	53.27
May 10	Southern Pacific Co., Pacific System	do	59.00
June 26	do	Transportation	.78
	Chicago and Northwestern Rwy. Co	Passenger transportation	74.30
	Sioux City and Pacific R. R. Co	do	14.16
	do	Transportation	1.06
Aug. 6	Fremont, Elkhorn and Missouri Valley R. R. Co.	Passenger transportation	14.08
Oct. 14	Southern Pacific Co	Transportation	2.05
	do	Passenger transportation	142.75
	do	do	30.85
	do	do	78.35
	do	do	26.24
	Sioux City and Pacific R. R. Co	do	4.53
	Total		721.17

LIBRARY.

1900.			
July 19	M. E. Mann	Books	$13.00
Aug. 1	Saml. H. Moore	Chautauqua library cases	30.00
	W. H. Lowdermilk & Co	Dictionaries	16.50
3	R. Carter Ballantyne	Books	42.25
10	Gaylord Bros	Adhesive parchment paper	.75
	The Macmillan Co	Cyclopedia of Horticulture	15.00
	R. L. Polk & Co	Medical and Surgical Register	10.00
	Sarah H. Killikelly	Curious Questions	2.00
	S. T. McLean & Co	Books	2.50
	do	Century Dictionary	50.00
	Lemcke & Buechner	Books	13.50
14	Richd. L. Lamb	Type	2.80
20	H. E. Hooper	Century Atlas	8.75
21	L. S. Rose	Botany Manuals	4.00
	Chas. L. Smith	Moore's Index Filicum	5.75
	Paul Klincksieck	Book	120.00
Sept. 7	Geo. T. King	Dictionary of Gardening	4.00
	The National Nurseryman Publishing Co.	National Nurseryman	1.00
17	R. Friedlander & Sohn	Books	13.55
	R. R. Bowker	Trade list	2.00
24	Lemcke & Buechner	Books	45.25
	do	do	42.00
	do	do	8.25
	do	do	7.90
	William Wesley & Son	do	7.50
	do	do	1.00
	do	do	2.50
	do	do	37.37
	do	do	11.24
	Bates Manufacturing Co	Pads	.30
	Gustav E. Stechert	Books	4.30
	Total first quarter		524.69
Oct. 4	R. Friedlander & Sohn	Books	29.95
	H. E. Hooper	Atlas	8.75
	Lemcke & Buechner	Books	9.90
	do	do	5.20
12	H. N. Paterson	Cards	22.50
15	Lemcke & Buechner	Books	22.69
Nov. 13	Elva E. Hicks	do	73.18
17	Chas. L. Smith	Book	3.50
20	Jno. D. Smith	Books	7.50
	J. N. Rose	do	5.25
22	Lawyers' Cooperative Publishing Co	Digest	12.00
	Bernard Quaritch	Books	23.13
	Henry Sampson	Southern Planter	20.00
23	The Plant World Co	Books	2.00
24	W. H. Lowdermilk & Co	do	10.65
27	R. Carter Ballantyne	Farm Implement News	1.35
	Chas. W. Smiley	Book	1.00

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

LIBRARY—Continued.

Date.	Name.	Nature of payment.	Total.
1900.			
Dec. 23	Fifth Avenue Auction Rooms	Books	$104.85
	Lemcke & Buechner	do	5.10
	do	do	5.00
	do	do	9.07
	do	do	2.76
	do	do	12.60
	do	do	30.21
	do	do	5.73
	do	do	33.93
	do	do	4.40
	do	do	4.15
	do	do	3.86
	do	do	2.95
	The Baker & Taylor Co	do	14.90
	The University of Chicago Press	do	2.80
	Chas. L. Smith	do	15.20
6	F. M. Morris	Guide to the United States	2.08
14	Wm. Wesley & Sons	Book	6.00
	do	do	5.00
	do	Subscription, vol. 1, Ramsay	2.50
	do	Books	2.48
17	Chas. L. Smith	do	12.00
18	Wm. Wesley & Sons	do	24.38
	do	do	10.00
	Library Bureau	Cards and trays	34.45
19	Municipal Engineering Co	Subscription	2.00
20	Lemcke & Buechner	Books	28.45
	do	do	15.18
	The Boston Book Co	do	10.00
	Gustav E. Stechert	do	17.57
	do	do	3.30
	A. Williams & Co	do	1.76
	Gustav E. Stechert	do	16.60
29	J. H. Steiner	do	4.50
	American Florist Co	Directory	2.00
	Allen's Press Clipping Bureau	Clippings	24.00
	Total second quarter		740.31
1901			
Jan. 3	A. A. Heller	Book	1.00
	R. Friedlander & Sohn	Books	15.98
4	Gustav E. Stechert	do	23.06
	do	do	8.63
	Lemcke & Buechner	do	1.68
	do	do	1.84
	do	do	2.30
	do	do	7.80
	do	do	10.09
	do	do	10.06
	do	do	16.55
	do	do	24.24
	do	do	38.71
7	Harrison G. Dyar	do	5.30
12	The Washington Post Co	Post	4.20
14	W. H. Lowdermilk & Co	Books	12.00
19	T. H. Castor & Co	do	39.12
	J. J. De Forest	The Prairie Farmer	1.30
	The Lawyers' Cooperative Publishing Co.	Digest	6.00
	H. V. & H. W. Poor	Book	10.00
21	Bates Manufacturing Co	Ink	.40
	The Macmillan Co	Books	10.00
	Thos. Meehan & Sons	Meehan's Monthly	4.00
	Jas. T. White & Co	Book	8.00
	Lemcke & Buechner	Books	49.56
	do	do	6.00
	do	do	19.85
	do	do	6.11
	do	do	11.50
	do	do	4.14
24	E. Morrison Paper Co	Trunk board	10.62
26	Lemcke & Buechner	Books	39.00
Feb. 2	Brentanos	do	61.34
	The National Conference of Charities and Corrections.	do	1.25
5	Gustav Fock	do	12.85
11	T. H. Castor & Co	do	6.52
	Jas. W. Withers	do	3.00
	American Society of Civil Engineers	do	3.75
	Brentanos	do	3.96

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

LIBRARY—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
Feb. 12	Library Bureau	Labels	$1.75
13	N. Murray	Books	10.00
	W. H. Lowdermilk & Co	do	4.00
	Paul Parey	do	3.57
19	Cambridge Botanical Supply Co	do	8.00
	Willard N. Clute	do	.55
	The Rural Northwest	do	3.00
21	The Macmillan Co	do	2.54
23	Gustav E. Stechert	do	5.16
	Lemcke & Beuchner	do	14.34
	do	do	17.85
	Gustav E. Stechert	do	52.71
	Lemcke & Beuchner	do	33.28
27	Jersey Bulletin Co	Book	5.00
28	Wm. Wesley & Son	Books	17.50
	do	do	11.25
	do	do	10.91
	do	do	5.00
	do	do	1.25
	Bernard Quaritch	do	3.65
Mar. 14	Wm. Ballantyne & Sons	do	6.40
15	Cumulative Index Co	Index, 1899–1900	10.00
18	Library Bureau	Case and card pockets	22.80
	Lemcke & Buechner	Books	2.75
	do	do	1.00
	do	do	1.00
	Gustav E. Stechert	do	32.70
	Lemcke & Buechner	do	.72
	Gustav E. Stechert	do	6.00
	T. H. Castor & Co	do	6.52
23	O. C. Warehime	Book	3.00
	Washington Academy of Science	do	1.00
	The Publishers' Weekly	do	3.50
	Total third quarter		810.41
Apr. 3	Lemcke & Buechner	Books	20.40
	do	do	35.23
	L. M. Underwood	Index cards	3.56
4	W. H. Lowdermilk & Co	Book	7.50
72	Wm. Wesley & Son	Books	12.00
	do	do	1.00
	The Field and Farm	do	2.00
	Frederick Muller & Co	do	38.00
18	Julius Kuhlman	do	.85
19	Wm. J. Gerhard	Pamphlets	4.55
22	Lemcke & Buechner	Books	5.26
23	American Medical Association	Book	5.00
29	Journal Compilation Medical and Veterinary Archives.	Books	6.00
	S. H. Smith	Woodworker, 3 vols	3.00
May 13	G. E. Stechert	Books	11.76
	R. R. Bowker	Literary index	3.50
	L. M. Underwood	Book	3.00
20	Library Bureau	Rules	1.00
	The Macmillan Co	Book	1.56
	N. W. Ayer & Son	do	5.00
24	Jno. A. Craig	Books	10.00
	Payot, Upham & Co	do	3.00
	C. R. Orcutt	do	1.00
	Lemcke & Buechner	do	3.12
June 11	Statute Law Book Co	do	16.50
14	R. Friedlander & Sohn	Foreign publications	28.40
	Wm. Wesley & Son	Book	1.50
	do	do	6.00
	do	Books	9.60
	Oswald Weigel	do	5.75
	Lemcke & Buechner	do	35.01
	do	do	25.90
	do	do	19.37
18	Wm. Ballantyne & Sons	do	2.70
	Lea Bros. & Co	do	3.50
22	The Lawyers' Cooperative Publishing Co	do	6.00
24	W. H. Lowdermilk & Co	do	78.25
	H. N. Patterson	Cards	22.50
	R. R. Bowker	Catalogues	12.50
	P. Blackiston's Son & Co	Book	3.50
	Lemcke & Buechner	do	38.12
	do	do	46.41

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

LIBRARY—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
June 24	W. H. Lowdermilk & Co	Book	$10.20
25	W. F. Porter	do	7.00
	Total fourth quarter		566.00
	Supplemental.		
July 2	Lyon, Kymer & Palmer Co	Book	1.08
8	National Railway Publishing Co	Subscription	5.00
	The Spanish-American Directories Co	Directory, West Indies	5.00
	Orange Judd Co	Books	1.50
9	Woodward & Lothrop	do	87.08
23	William Wesley & Son	do	50.00
	Lemcke & Buechner	Periodicals	20.25
	Library Bureau	Labels	3.66
24	Brentanos	Books	6.00
	Thos. Howell	do	1.00
31	The Sun Printing and Publishing Association.	Subscription	8.00
	Saml. D. Craig, jr	Binders	3.00
Aug. 1	Rand, McNally & Co	Atlas	7.50
2	R. B. Hough	American woods	4.00
3	Encina Publishing Co	Book	3.00
19	California Fruit Grower	Subscription	2.00
20	Gustav E. Stechert	Books	2.76
Oct. 10	Lemcke & Buechner	do	2.20
	do	do	38.97
	Total supplemental		252.00

RECAPITULATION.

First quarter	$524.69
Second quarter	740.31
Third quarter	810.41
Fourth quarter	566.00
Supplemental	252.00
Total	2,893.41

CONTINGENT EXPENSES.

Date.	Name.	Nature of payment.	Total.
1900.			
July 13	Washington City post-office	Stamps	$500.00
19	Geo. F. Muth & Co	White lead	11.90
	R. P. Clarke Co	Towels	262.75
31	Jas. Halley et al	Salaries	160.00
Aug. 1	Richd. L. Lamb	Pads, etc	10.00
	Easton & Rupp	Standard Dictionary	1.85
	R. C. M. Burton	Awnings	49.00
	The Maurice Joyce Engraving Co	Engraving plates	1.50
3	J. P. Nawrath	Cotton, twine, etc	163.24
	R. P. Clarke Co	Feather dusters	37.70
	do	Nets	.50
	The Allegheny Co	Coal	3.32
	The A. J. Joyce Carriage Co	Axle grease, etc	30.80
4	David A. Collins	Labor	72.00
10	H. E. Davison & Co	Copying books	162.00
	F. H. Lovell & Co	Clock	7.25
	The Chesapeake Electric Co	Key sockets, etc	7.90
	Safety Bottle & Ink Co	Writing fluid	12.00
	N. P. Bush	Soap	8.70
	Pearre E. Crowl Co	Stamp gum	59.00
	Eberhard Faber	Rubber bands	370.15
	Library Bureau	Oak cases	204.00
	F. Lower	Hemming towels	3.00
11	Austin Smith	Paper	92.00
14	D. Frank Parker	Typewriter paper	314.40
	Thos. Somerville & Sons	Bricks and cement	75.60
	W. M. Galt & Co	Hay	40.48
	Jennie T. Thomson	Stamping letter heads	29.70
	L. S. Depue	Oats	46.20
	M. Du Perow	Electric fans	251.10
	do	do	19.00
	Louis Hartig	Horseshoeing	19.75
	W. G. Sargent	Hose menders	5.40
	Capital Traction Co	Fare tickets	41.50
	The Maurice Joyce Engraving Co	Engraving plates	3.00
	B. B. Ernshaw & Bro	Rye straw	15.22
	National Electric Supply Co	Fuse wire, etc	5.35

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

CONTINGENT EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
1900.			
Aug. 14	Rudolph, West & Co	Hardware	$150.86
	do	do	38.50
	do	Hose, etc	33.08
	R. Carter Ballantyne	Pens, baskets, etc	72.46
	Z. D. Gilman	Naphtha, in cans	1.00
20	H. E. Hooper	Century atlases	35.00
	Manhattan Electric Supply Co	Duplex office wire	5.00
21	Washington Gaslight Co	Gas	16.80
	United States Electric Lighting Co	Electric lighting	108.55
	National Mortar Co	Mortar	4.00
24	Jno. C. Parker	Stationery	739.95
	The McDermott Carriage Co	Repairs to carriage	82.25
25	W. H. Lacy	Plastering, etc	16.50
	Jno. D. Frazee	Washing towels	21.44
	The J. C. Ergood Co	Soap	64.00
	S. P. Johnson	Typewriter cabinet	23.75
	C. Becker	Repairing harness	46.80
	Hugh Reilly	Oils, paints, etc	7.35
29	H. O. Wilber	Asbestos covering	3.60
31	Jas. Halley et al	Salaries	160.00
Sept. 12	William Lewis	Recaning chairs	1.00
5	Jas. Wilson	Traveling expenses	24.50
	The McDermott Carriage Co	Carriage hire	7.20
	American Ice Co	Ice	107.52
7	Z. D. Gilman	Horse medicine	1.25
	Ernest Betz	Ventilation and repairing	17.00
	B. B. Earnshaw & Bro	Bran and straw	15.57
	Church & Stephenson	Lumber	94.98
	Wyckoff, Seamans & Benedict	Repairing typewriter	29.54
	L. S. Depue	Oats	69.30
	W. M. Galt & Co	Hay	33.00
	Eberhard Faber	Erasers	8.64
	United States Envelope Co	Envelopes	35.70
	Library Bureau	Book stacks, etc	102.50
	Geo. Meier & Co	Bronze	10.50
12	United States Electric Lighting Co	Electric current	111.35
	Washington Gaslight Co	Gas	17.70
	C. Becker	Stable supplies	13.02
	W. B. Moses & Sons	Rug and desk	31.55
	Jno. P. Turner	Services	5.00
15	Arthur Arrington	Fire extinguishers	90.00
17	The Tablet and Ticket Co	Figures	.30
	J. H. Bunnell & Co	Cards	12.75
	Eberhard Faber	Bands	4.00
	American Ice Co	Ice	121.98
	Chas. Becker	Oil and paint	67.47
	Chas. R. Edmonston	Glasses, etc	13.55
	Jas. B. Lambie	Rasps, etc	10.16
18	C. S. Braisted	Pencils	60.51
	Mittag & Volger	Carbon paper	37.20
19	Rudolph, West & Co	Envelope openers, etc	10.99
21	Capital Traction Co	Fare tickets	41.50
	W. B. Moses & Sons	Desks and tables	498.20
	do	Matting, etc	81.55
22	Johnson Bros	Coal	1,409.96
	do	Coal and wood	283.49
	Geo. W. Hill	Traveling expenses	15.18
24	W. B. Moses & Sons	Desks, etc	122.50
	Chas. Becker	Glazier diamond	3.50
	Thos. Somerville & Sons	Pipe fitting, etc	78.21
	Library Bureau	Oak base	22.00
	do	Cards	19.20
	United States Envelope Co	Envelopes	326.20
29	Jas. Halley et al	Salaries	236.00
	Total first quarter		9,031.37
Oct. 1	R. Carter Ballantyne	Pens	8.20
	Jno. D. Frazee	Washing towels	24.11
	The Oliver Typewriter Co	Repairing typewriter	2.00
	Mackall Bros	Camphor	10.50
2	Hugh Reilly	Paints	5.67
	E. F. Vermillion	Inspecting boilers	20.00
3	I. P. Roosa	Services	75.00
4	Eberhard Faber	Bands	91.40
	F. H. Lovell & Co	Clock	1.62
	The Chesapeake Electric Co	Electric supplies	7.54
8	Washington City post-office	Stamps	500.00
10	Chas. Becker	Oil	6.15
	S. P. Johnson	Typewriter, repairs to	5.00
	L. S. Depue	Oats	46.20
	D. F. Parker	Typewriter ribbons	13.50

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

CONTINGENT EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
1900.			
Oct. 10	W. M. Galt & Co	Hay	$33.00
12	C. A. Joerissen	Cylinder for typewriter	2.75
	S. P. Johnson	Typewriters	120.00
	M. Du Perow	Electric fans	64.40
	Mackall Bros	Roach paste	4.95
	Instantaneous Fire Alarm Co	Rent of boxes	15.00
	Jno. D. Frazee	Washing towels	21.44
	American Ice Co	Ice	99.17
15	H. C. Roberts Electric Supply Co	Holders and tube	2.70
	The Okonite Co	Wire	12.50
16	Rudolph, West & Co	Hooks, etc	19.93
	Wm. Murray & Son	Roachain	15.00
	United States Electric Lighting Co	Lights and fans	94.58
	Washington Gaslight Co	Gas	17.30
20	Church & Stephenson	Lumber	61.10
	United States Electric Lighting Co	Lamps	10.00
	R. C. M. Burton	Awnings	12.00
	The Andrew J. Joyce Carriage Co	Repairing surrey	19.10
	Ernest Betz	Repairs	15.50
	D. Frank Parker	Stencil paper, etc	345.00
	Thos. Somerville & Sons	Tank, etc	5.35
24	Southern Railway Co	Passenger transportation	15.30
	Jno. C. Parker	Cabinet, stationery supplies, etc	498.06
25	W. P. Cutter	Traveling expenses	15.90
20	Geo. F. Muth & Co	Turpentine, etc	33.69
	do	Paints	1.80
	Postal Telegraph Cable Co	Telegraph service	10.07
	W. H. Rupp, agent	Envelopes	164.00
	do	Pen	4.00
	The J. C. Ergood Co	Pearline	17.25
	Fred A. Schmidt	Ink	8.85
	The Maurice Joyce Engraving Co	Engraving autographs	2.50
	National Electric Supply Co	Binding posts	1.71
	Geo. F. Muth & Co	Lead, varnish, etc	61.68
31	Jas. Halley et al	Salaries	227.50
Nov. 1	S. P. Johnson	Typewriter	60.00
	U. S. Engraving and Stamp Works	Material for rubber stamps	15.75
2	J. P. Nawrath	Sponge	14.00
	The Burnet Co	Batteries	17.50
	Library Bureau	Furniture	60.00
	The Chesapeake Electric Co	Tubing	4.25
	J. H. Bunnell & Co	Lamp cord	8.75
	United States Envelope Co	Envelopes	19.60
	The Chesapeake and Potomac Telephone Co	Telephone service	60.39
	do	do	15.00
	do	do	7.08
3	R. P. Clarke Co	Whisk brooms	10.00
8	B. B. Earnshaw & Bro	Bran	.83
15	L. L. Karns	2 bay horses	425.00
	J. H. Brigham	Traveling expenses	529.25
17	Rudolph, West & Co	Locks, etc	45.99
20	F. H. Lovell & Co	Clocks	2.43
	Jno. D. Frazee	Washing towels	25.70
	Wm. J. Zeh	Coal	26.76
	R. P. Clarke Co	Dusters	16.38
21	B. B. Earnshaw & Bro	Feed	16.28
	H. C. Roberts Electric Supply Co	Cells, shades, etc	33.00
	M. Du Perow	Electric supplies	9.65
	American Ice Co	Ice	88.99
24	Jno. R. Galloway	Annunciator	6.00
27	U. S. Electric Lighting Co	Lights and fans	61.78
	Washington Gaslight Co	Gas	22.10
	The Maurice Joyce Engraving Co	Plates for stamp factory	1.00
30	Jas. Halley et al	Salaries	300.50
Dec. 1	Johnson Bros	Wood, etc	147.07
3	Library Bureau	Case, etc	68.50
	do	Cards	9.50
	The Carter's Ink Co	Ink	17.00
	F. H. Lovell & Co	Clock	7.25
	Pearre E. Crowl Co	Rubber stamps	54.00
	W. M. Galt & Co	Hay	38.28
	D. Frank Parker	Typewriter ribbons	24.25
	Wyckoff, Seamans & Benedict	Repairs to typewriter	39.95
	Florence Lower	Hemming towels	1.00
5	The Hartman Printing Co	Rent of directory	.75
	W. B. Moses & Sons	Furniture, etc	303.19
	do	do	412.28
6	Jas. S. Barron & Co	Oil, etc	9.25
	United States Envelope Co	Envelopes	38.90
	Chas. Becker	Oil	33.00

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

CONTINGENT EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
1900.			
Dec. 6	Hugh Reilly	Paints	$8.56
	Church & Stephenson	Lumber	67.00
	H. O. Wilbur	Pipe covering	2.16
	The Allegheny Co	Coal	20.09
	Z. D. Gilman	Arnica	2.00
	M. Du Perow	Dials, brackets, etc	14.60
	L. S. Depue	Oats	46.20
11	The Andrew J. Joyce Carriage Co	Carriage grease, etc	2.25
	William Lewis	Caning chairs	1.00
14	Eberhard Faber	Pencils and erasers	159.24
	The Hahn Manufacturing Co	Shoes for horses	18.75
	D. Frank Parker	Typewriter paper	92.70
17	Mackall Bros	Soap	3.35
	Rudolph. West & Co	Zinc, shears, etc	67.40
	Church & Stephenson	Lumber	87.71
	do	do	32.40
	R. Carter Ballantyne	Stationery supplies	17.65
	M. Du Perow	Dials	2.50
	Wyckoff, Seamans & Benedict	Letter paper	72.60
	Leidy S. Depue	Oats	46.20
	Fred. A. Schmidt	Ink	6.75
18	Ernest Betz	Repairing roof, etc	96.74
19	American Ice Co	Ice	63.39
	James S. Topham	Mail bags	13.50
	H. J. Webber	Traveling expenses	32.20
20	Clark & Davenport	Carpet, etc	84.39
	The Chesapeake Electric Co	Desk buttons	1.11
21	United States Electric Lighting Co	Lights and fans	63.86
	Washington Gaslight Co	Gas	25.20
	The Andrew J. Joyce Carriage Co	Repairs to carriage	127.50
26	John D. Frazee	Washing towels	27.08
29	Wm. H. Rupp, agent	Envelopes	148.75
	Thos. Somerville & Sons	Repairs, etc	10.78
	The Maurice Joyce Engraving Co	Engraving	2.50
31	James Halley et al	Salaries	279.75
	Total second quarter		7,725.96
1901.			
Jan. 2	Southern Rwy. Co	Passenger transportation	15.30
	Baltimore and Ohio R. R. Co	do	10.00
3	Washington city post-office	Stamps	500.00
5	Johnson Bros	Fuel	602.27
	W. M. Galt & Co	Hay	34.77
	The Hammond Typewriter Co	Repairing typewriters	15.00
	Leidy S. Depue	Feed	25.60
	Phillip Lindemeyr	Ink	16.02
	M. P. Bush	Soap	30.00
	United States Envelope Co	Envelopes	32.90
7	Hugh Reilly	Paint and glass	12.91
	Church & Stephenson	Lumber	52.75
	Johnson Bros	Coal	440.19
	Jno. R. Galloway	Annunciator	6.00
	The Capital Traction Co	Car tickets	41.50
	United States Express Co	Transportation	6.65
11	D. Frank Parker	Typewriter paper, etc	101.25
	Jno. C. Parker	Pencil pointer	3.50
12	Instantaneous Fire Alarm Co	Rent boxes	15.00
14	I. P. Roosa	Services	75.00
	Chas. R. Edmonston	Buckets and cooler	11.00
	W. H. Butler	Paint-shop supplies	2.25
	Rudolph. West & Co	Hardware	15.94
	Z. D. Gilman	Sponges	4.95
	Jno. C. Parker	Stationery supplies	1,142.23
11	Washington Branch, Hammond Typewriter Co.	Repairing typewriter	15.00
	United States Electric Lighting Co	Lights, etc	73.76
	American Ice Co	Ice	59.95
	Washington Gaslight Co	Gas	27.40
	United States Electric Lighting Co	Lights in building	10.00
18	Richard S. Lamb	Pads	4.75
	Wm. H. Rupp	Excelsior journal	3.00
	W. B. Moses & Sons	Furniture, etc	567.47
	Albert Kahlert & Co	Cleaning rugs, etc	80.69
	Fred. A. Schmidt	Ruling pens	6.72
	Washington Branch, Hammond Typewriter Co.	Repairing typewriter	15.00
	Jas. B. Lambie	Hardware	36.04
19	J. B. Kendall	Pads	12.00
	R. P. Clarke Co	Dusters, etc	33.28
	United States Engraving and Stamp Works	Daters	25.50
	Safety Bottle and Ink Co	Ink	12.25
21	Jno. Underwood & Co	do	3.00

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

CONTINGENT EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
Jan. 21	Eberhard Faber	Bands	$32.40
	United States Envelope Co	Envelopes	13.83
	Library Bureau	Index guides	1.15
	Phillip Lindemeyr	Stamp ink	6.00
	C. S. Braisted	Pencils	35.24
22	The Geo. W. Knox Express Co	Transportation	1.10
	do	do	1.41
	Jno. C. Parker	Record paper, etc	100.57
	The Chesapeake and Potomac Telephone Co	Changing telephone	1.95
	Capital Traction Co	Car tickets	41.50
	Thos. Somerville & Sons	Marble slabs	16.38
	Hugh Reilly	Glass	9.10
	The Andrew J. Joyce Carriage Co	Repairs to carriage	26.00
	do	do	6.50
24	Grafton & Sons	Repairing roofs	161.50
	do	Repairing gutters, etc	39.97
	do	Tinning	36.80
	Thos. W. Smith	Doors	6.60
	Cleveland Cycle Co	Repairing bicycle	7.45
	Jno. C. Parker	Letter press	22.72
	R. Carter Ballantyne	Pins and wastebaskets	28.05
	Pearre E. Crowl Co	Stamp rubber, etc	55.56
	J. H. Brigham	Traveling expenses	17.00
26	Hugh Reilly	Glass	6.50
	Orient Cycle Co	Bicycle	33.00
	The Maurice Joyce Engraving Co	Engraving autographs	2.00
	Burrelle's Press Clipping Bureau	Clippings	3.50
29	The Allegheny Co	Coal	26.62
30	Smithsonian Institution	Transportation exchanges	41.20
31	Jas. Halley et al	Salaries	244.10
Feb. 2	Johnson Bros	Coal	705.17
	Library Bureau	Case and cards	27.00
	Louis Hartley	Horseshoes, etc	13.26
5	Wm. H. Rupp	Fountain pens	4.00
6	Southern Rwy. Co	Passenger transportation	27.50
	Leidy S. Depue	Feed	48.70
8	C. Becker	Stable supplies	55.36
	Standard Oil Co	Oil	27.61
	W. M. Galt & Co	Hay	33.00
11	Jno. Reynders & Co	Stable supplies	5.00
	The Carters Ink Co	Ink and mucilage	18.60
	Bates Manufacturing Co	Ink	9.00
	M. Du Perow	Electric supplies	1.40
	American Ice Co	Ice	54.10
12	W. B. Moses & Sons	Furniture	91.85
	do	Desk	28.00
	The Strowger Automatic Telephone Exchange.	Rent	3.00
	The Chesapeake Electric Co	Electric supplies	1.45
	Library Bureau	Cards	.60
	United States Envelope Co	Envelopes	11.88
	The Chesapeake and Potomac Telephone Co	Telephone rent	15.00
	do	do	7.00
	do	Telephone service	62.50
13	Johnson Bros	Wood	137.54
	do	Coal	486.37
	R. P. Clarke Co	Whisk brooms	12.00
	Standard Oil Co	Benzine and can	1.15
	Church & Stephenson	Lumber	97.93
14	Richard L. Lamb	Stencil plate, etc	.55
	The Smith Premier Typewriter Co	Repairs to typewriter	7.50
18	S. P. Johnson	do	2.25
	Jennie T. Thomson	Embossing	65.70
	Hugh Reilly	Glass and glue	5.45
20	J. H. Brigham	Traveling expenses	23.73
	Jno. D. Frazee	Washing towels	22.66
	do	do	28.19
21	D. Frank Parker	Typewriter ribbons	63.00
	Chas. Becker	Oil finish, etc	42.30
	Jno. C. Parker	Typewriter desk, etc	50.50
23	Postal Telegraph Cable Co	Telegraph service	30.65
	Western Union Telegraph	do	12.58
26	Hugh Reilly	Glass	3.85
	Geo. F. Muth & Co	Painting materials	65.67
	Harris & Shafer Co	Repairing clocks, etc	11.10
	Wm. H. Rupp	Fountain pen	4.00
	Thos. Somerville & Sons	Hardware	19.90
	Z. D. Gilman	Prescription	1.00
	do	Naphthaline	1.00
	Rudolph, West & Co	Nails, etc	6.28
	United States Electric Lighting Co	Electric current, etc	82.90
	Washington Gaslight Co	Gas	30.70

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

CONTINGENT EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
Feb. 27	Adams Express Co	Transportation	$6.91
28	United States Envelope Co	Envelopes	11.88
	J. H. Bunnell & Co	Lamp cord	8.75
	Jas. Halley et al	Salaries	241.59
Mar. 1	Mackall Bros	Soap, etc	20.95
	W. B. Moses & Sons	Furniture, etc	40.36
5	Capital Traction Co	Car tickets	41.50
	Johnson Bros	Coal and wood	960.31
8	Chas. E. Hodgkin	Plate glass counter	27.00
13	C. Becker	Hoof packing	4.27
	W. M. Galt & Co	Hay	36.80
	National Electrical Supply Co	Sockets	2.40
	Jno. C. Parker	Bookcase	20.35
	L. S. Depue	Feed	48.70
14	Rudolph, West & Co	Hardware, etc	15.39
	The Geo. W. Knox Express Co	Transportation	2.00
18	Eberhard Faber	Bands	99.52
	H. Kohnstamm & Co	Ink	3.00
	United States Engraving and Stamp Works	Material for rubber stamps	4.05
	C. Becker	Stable supplies	24.98
	Richard L. Lamb	Daters and date bands	7.40
	D. Frank Parker	Typewriter paper, etc	94.50
	J. B. Perkins	Horses	225.00
	American Ice Co	Ice	46.35
19	B. B. Earnshaw & Bro	Feed, etc	16.91
	The A. J. Joyce Carriage Co	Repairs to carriage	2.00
	M. Du Perow	Speaking tubes	.90
	J. T. Thomson	Stamping	7.00
	Thos. Somerville & Sons	Pipe fittings, etc	105.10
20	Burrelle's Press Clipping Bureau	Clippings	2.98
23	R. Carter Ballantyne	Stationery supplies	109.22
	Jno. S. P. Green	Wall paper	73.50
	P. H. Heiskell, jr., & Co	Harness	50.00
	Adams Bros	Ventilator elbows	1.00
25	Jno. C. Parker	Pencil pointers, etc	2.40
	The Chesapeake and Potomac Telephone Co	Moving telephone	.30
	Washington Gaslight Co	Gas	28.00
	United States Electric Lighting Co	Electric current	63.64
30	Jas. Halley et al	Salaries	380.10
	Total third quarter		10,624.03
Apr. 1	Jno. C. Parker	Stationery supplies	699.61
	Louisville and Nashville R. R. Co	Passenger transportation	9.17
2	Jas. B. Lambie	Hardware	15.79
	The Allegheny Co	Coal	3.32
	C. A. Schneider's Sons	Cover for vault	5.00
	Richd. L. Lamb	Ink	11.50
3	Burrelle's Press Clipping Bureau	Clippings	2.40
	The Hahn Manufacturing Co	Horseshoes	11.25
	I. P. Roosa	Services	75.00
9	Ernest Betz	Ventilators	3.50
	do	Repairs	34.58
	Cleveland Cycle Co	Repairing bicycle	.75
10	The J. C. Ergood Co	Pearline	17.25
	Rudolph, West & Co	Brushes, etc	24.45
	S. P. Johnson	Repairing typewriter	5.00
	L. S. Depue	Feed	48.70
	W. H. Veerhoff	Molding	4.80
	W. B. Moses & Sons	Furniture	170.50
	W. M. Galt & Co	Hay	28.88
	Church & Stephenson	Lumber	182.27
	do	do	13.77
11	Thos. W. Smith	do	2.52
12	Valley Paper Co	Paper	65.00
16	Library Bureau	Cabinet cases, etc	168.00
	Jno. C. Parker	Clips	86.40
	do	Cabinet, etc	45.39
	Rudolph, West & Co	Dumb waiter	59.50
	Mackall Bros	Soap, etc	110.53
	do	Matches	3.36
	Capital Traction Co	Fare tickets	41.50
17	American Ice Co	Ice	53.63
19	Geo. F. Lasher	Postal Guides	25.00
	The Strowger Automatic Telephone Exchange.	Telephone rent	1.50
	Instantaneous Fire Alarm Co	Rent of alarm box	15.00
20	United States Electric Lighting Co	Lighting grounds	11.00
	do	Lights, etc	78.06
	Washington Gaslight Co	Gas	32.80
	Estler Bros. & Co	Matches	1.65
22	Johnson Bros	Wood	132.25

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

CONTINGENT EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
Apr. 22	Johnson Bros	Coal	$941.77
	Manhattan Electric Supply Co	Pliers	1.30
	F. H. Lovell & Co	Clocks	14.50
	Richd. L. Lamb	Stamp, ink, etc	18.65
	Louis Hartig	Horseshoes	4.25
	Jas. B. Lambie	Hardware for blacksmith shop	5.37
	Thos. Somerville & Sons	Plumbing materials	173.93
	The Pullman Co	Passenger transportation	8.50
	The New York, New Haven and Hartford R. R. Co.	do	4.25
24	Wyckoff, Seamans & Benedict	Repairing typewriter	57.55
	C. Becker	Stable supplies	31.75
	H. C. Davison & Co	Copying books	81.60
	Rand, McNally & Co	Maps	18.00
26	Burrelle's Press Clipping Bureau	Clippings	2.70
27	I. P. Roosa	Expenses	114.81
	United States Express Co	Transportation	7.02
	Adams Express Co	do	8.61
30	Jas. Halley et al	Salaries	367.10
May 1	Wm. J. Zeh	Coal	5.39
	W. B. Moses & Sons	Chairs	5.60
	do	Mirrors	2.00
	J. T. Thomson	Stamping	14.88
	Ernest Betz	Tinning	10.18
2	Washington City post-office	Stamps	500.00
	Smith Premier Typewriter Co	Repairs to typewriter	8.70
3	The Chesapeake and Potomac Telephone Co	Telephone rent	62.50
	do	do	15.00
	do	do	7.00
	do	do	5.28
	do	Telephone call	.10
4	R. P. Clarke & Co	Tape	5.37
8	Western Union Telegraph Co	Telegraph service	4.89
	do	do	7.64
13	Burrelle's Press Clipping Bureau	Clippings	2.50
	Richd. L. Lamb	Rubber stamp pad	2.25
	H. C. Roberts Electric Supply Co	Batteries	10.00
16	United States Electric Lighting Co	Electric lights	63.43
	American Ice Co	Ice	59.59
	The A. J. Joyce Carriage Co	Repairs to carriage	58.25
	Chas. Becker	Oil	15.00
	L. S. Depue	Oats	46.20
	Jas. B. Lambie	Packing and nails	8.55
	W. M. Galt & Co	Hay	36.05
	D. Frank Parker	Typewriter, paper, etc	105.30
17	Rudolph, West & Co	Scissors	29.67
	Jno. D. Frazee	Washing towels	85.59
20	J. P. Nawrath	Sponges	7.00
24	Library Bureau	Cards, etc	59.20
	F. H. Lovell & Co	Clock	.81
27	Church & Stephenson	Lumber	30.00
28	Western Union Telegraph Co	Service	2.57
	do	do	3.88
	do	do	3.15
	do	do	2.73
	do	do	4.87
	do	do	13.70
	R. P. Clarke Co	Feather dusters	8.20
	W. H. Rupp, agent	Envelopes	4.50
	W. B. Moses & Sons	Leather cushions	1.50
	The A. J. Joyce Carriage Co	Axle grease	16.67
	The Allegheny Co	Coal	10.08
	Thos. Somerville & Sons	Basins, etc	161.80
31	Jas. Halley et al	Salaries	6.00
June 3	W. H. Rupp	Cards, etc	2.00
	W. H. Dyer	Molding	7.74
	United States Envelope Co	Envelopes	4.40
	Wyckoff, Seamans & Benedict	Repairs to typewriter	2.35
	do	do	32.12
	B. B. Ernshaw & Bro	Straw and bran	17.00
4	R. P. Clarke Co	Towels	28.63
	Geo. F. Muth & Co	Lead, japan, etc	10.27
	R. Carter Ballantyne	Pens, etc	27.30
	Washington Gaslight Co	Gas	12.00
	Josephine Clark	Traveling expenses	20.04
5	W. B. Moses & Sons	Chairs, etc	20.75
	Capital Traction Co	Fare tickets	8.28
14	Adams Express Co	Transportation	.50
	The Smith Premier Typewriter Co	Repairs to typewriter	1.94
	Burrelle's Press Clipping Bureau	Clippings	8.75
18	J. H. Burnell & Co	Silk cord	23.10
	Leidy S. Depue	Oats	39.35
	C. Becker	Supplies	

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

CONTINGENT EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
June 18	The Maurice Joyce Engraving Co	Engraving	$1.50
	American Ice Co	Ice	71.53
19	W. M. Galt & Co	Hay	36.96
	Johnson Bros	Wood	79.35
21	Thos. W. Smith	Molding	.96
	Ernest Betz	Repairs	4.25
	Johnson Bros	Coal	352.50
	Western Union Telegraph Co	Service	16.61
22	Charles Grose	Caning chairs	.85
	Harris & Shafer Co	Repairing clock	1.60
	R. C. M. Burton	Putting up awnings	38.00
25	Jas. K. Taylor	Traveling expenses	7.55
	Welsbach Co	Lights with glass	5.60
	B. B. Ernshaw & Bro	Feed	16.95
	W. H. Lowdermilk & Co	Dictionaries	13.40
27	Mackall Bros	Camphor	3.50
	United States Electric Lighting Co	Electric current	55.42
	do	Use arc lamp	7.73
	Washington Gaslight Co	Gas	22.00
28	Wyckoff, Seamans & Benedict	Repairs to typewriter	.50
	Rudolph, West & Co	Cuspidors	22.76
29	Jas. Halley et al	Salaries	156.60
	Total, fourth quarter		6,856.75
	Supplemental.		
July 2	Blue Line Transfer Co	Transportation	3.95
	Rand, McNally & Co	Maps	8.50
6	I. P. Roosa	Services	75.00
9	The Allegheny Co	Coal	6.94
	Johnson Bros	do	23.50
	Instantaneous Fire Alarm Co	Box rent	15.00
13	The Chesapeake and Potomac Telephone Co	Moving telephones	5.30
	The Geo. W. Knox Express Co	Transportation	3.32
16	Journal Newspaper Co	Advertising	15.00
	Tribune Association	do	34.00
	Sun Printing and Publishing Association	do	34.00
	The Washington Post Co	do	14.30
	do	Subscription	4.20
17	The Strowger Automatic Telephone Exchange.	Rent	1.50
19	Washington Gaslight Co	Gas	19.60
	United States Express Co	Transportation	4.96
22	United States Electric Lighting Co	Current	75.33
24	Tribune Co	Advertising	27.00
	The Smithsonian Institution	Transportation	12.80
29	W. H. Rupp	Bookholder	2.50
30	Leidy S. Depue	Oats	36.30
	The Broadstreet Co	Subscription	75.00
Aug. 1	Jno. C. Parker	Supplies	209.39
	Rand, McNally & Co	Atlas	7.50
2	Burrelle's Press Clipping Bureau	Clippings	2.72
	G. F. Muth & Co	Lead, etc	22.50
	Albert Kahlert & Co	Cleaning carpets, etc	63.22
	Jennie T. Thomson	Stamping stationery	7.29
	Church & Stephenson	Lumber	16.90
	W. B. Moses & Sons	Desk and stool	20.30
9	American Ice Co	Ice	92.89
10	Chas. E. Edmonston	Tumblers, etc	20.65
12	Rudolph, West & Co	Chamois skins, etc	7.40
	The Geo. W. Knox Express Co	Transportation	2.50
13	Jno. C. Parker	Railway Guide	5.00
16	Clark & Davenport	Carpet, etc	68.01
21	The Chesapeake and Potomac Telephone Co	Rent	97.75
22	Blue Line Transfer Co	Transportation	3.25
Sept. 7	American Bicycle Co	Tire and repairs	5.00
Oct. 11	Evening Star Newspaper Co	Advertising	9.90
	The Times Co	do	9.90
	The Geo. W. Knox Express Co	Transportation	2.48
12	Postal Telegraph-Cable Co	Service	1.63
	Total		1,174.18

RECAPITULATION.

First quarter	$9,031.37
Second quarter	7,725.96
Third quarter	10,624.03
Fourth quarter	6,856.75
Supplemental	1,174.18
Total	35,412.29

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

ANIMAL QUARANTINE STATIONS.

[1900-1901.]

Date.	Name.	Nature of payment.	Total.
1900.			
July 24	S. R. Burch	Traveling expenses	$31.00
Aug. 3	Thos. Hawkins	Labor	22.50
7	Geo. W. Pope et al	Salaries	239.10
	Harry F. Hume	Services	39.00
	Patk. Dorsey	do	39.00
	W. H. Wade	Salary	75.80
10	Conant & Co	Nails	46.50
11	Thacher & Ireland	do	7.95
28	W. C. Pennywitt	Traveling expenses	36.50
	S. R. Burch	do	29.20
29	Fred. A. Schmidt	Repairs to transit	5.00
Sept. 7	Patk. Dorsey	Labor	39.00
	W. H. Wade	Salary	75.80
	Harry F. Hume	Labor	43.50
	Campbell, Morrell & Co	Feed	22.47
	Geo. W. Pope	Traveling expenses	5.02
	Geo. W. Pope et al	Salaries	239.10
10	Jno. H. Merselis et al	Purchase of land	9,447.00
17	Jas. B. Lambie	Nails	3.15
	W. C. Pennywitt	Traveling expenses	11.25
	do	Expenses	1.60
18	Geo. W. Pope	Traveling expenses	5.75
22	do	Expenses	1.15
	Total, first quarter		10,466.32
Oct. 5	W. H. Wade	Salary	73.40
8	Geo. W. Pope et al	Salaries	240.43
12	E. B. Jones	Traveling expenses	3.86
15	Patk. Dorsey	Labor	34.50
	Harry F. Hume	do	37.50
23	Geo. W. Pope	Traveling expenses	1.85
	A. G. G. Richardson	do	22.06
	Conant & Co	Cement	7.95
	do	do	8.40
	H. J. Harwood	Rent of land	62.50
24	Pennsylvania R. R. Co	Passenger transportation	20.00
29	J. E. Merselis and H. Merselis	Purchase of lands	4,171.20
	Henry Kesse	do	996.80
	Albert Brauer	do	2,000.00
Nov. 1	New York and New Jersey Telephone Co	Telephone service	24.00
	Chas. Hubinger	Repairing wells	13.07
2	Joseph Strudwicke	Labor on wells	11.25
	Walworth Construction and Supply Co	Repairs to pump	4.02
	The Mansfield Plumbing Co	Repairing wells	17.80
	R. W. Burrell	Pipe	5.67
6	Wm. H. Wade	Salary	75.80
12	A. G. G. Richardson	Expenses	.75
13	W. C. Pennywitt	Traveling expenses	14.62
	do	Expenses	2.70
14	The Garfield Land Association	Land rent	450.00
	Harry F. Hume	Salary	40.50
	Patrick Dorsey	do	34.50
15	Geo. W. Pope et al	Salaries	256.00
17	do	Traveling expenses	2.15
22	The Real Estate and Improvement Co	Rent of land	56.25
Dec. 3	Walworth Construction and Supply Co	Oil	1.40
	B. F. Smith & Bro	Well pipes	270.00
	do	Pump, etc	6.31
7	Geo. W. Pope et al	Salaries	248.00
	do	Expenses	6.38
10	W. H. Wade	Salary	73.40
11	Harry F. Hume	do	39.00
14	Patrick Dorsey	do	25.50
20	Baltimore and Ohio R. R. Co	Passenger transportation	10.00
26	Victor A. Norgaard	Traveling expenses	28.30
	Total, second quarter		9,397.82
1901.			
Jan. 2	Jno. R. Mohler	Traveling expenses	22.65
	Pennsylvania R. R. Co	Passenger transportation	10.00
	Elenor Snyder	Sale of land	6,390.00
	Michl. Growney	do	2,700.00
	Chas. and Albert Brauer	do	600.00
3	G. T. Zabriskie	Repairs to harness	2 55

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

ANIMAL QUARANTINE STATIONS—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
Jan. 3	Maremus Koppenaal	Wagon body	$20.00
	Thacher & Ireland	Coal	8.03
8	Wm. H. Wade	Salary	75.80
	Geo. W. Pope et al	Pay roll	256.00
11	W. C. Pennywitt	Traveling expenses	34.62
	do	Expenses	31.55
14	Harry F. Hume	Salary	43.50
18	A. G. G. Richardson	Traveling expenses	16.72
	Geo. W. Pope	do	5.64
	do	do	1.85
	do	Expenses	.50
19	Wild Bros	Stone posts	17.43
	J. C. Philbrook	Horseshoeing	3.00
	The Real Estate and Improvement Co. of Baltimore.	Land rent	56.25
23	H. J. Harwood	do	62.50
24	A. G. G. Richardson	Expenses	5.32
	Adolph Kroll	Carbolic acid	19.50
	The New York and New Jersey Telephone Co.	Telephone service	23.90
30	The Garfield Land Association	Land rent	450.00
Feb. 1	The J. A. Van Winkle Co	Glass, lead, etc	11.05
6	Baltimore and Ohio R. R. Co	Passenger transportation	20.00
7	G. W. Pope et al	Pay roll	261.80
8	W. H. Wade	Salary	77.50
16	Geo. W. Pope	Traveling expenses	2.45
	Harry F. Hume	Salary	46.50
21	Geo. W. Pope	Expenses	10.92
	R. J. O'Brien	Feed	33.10
27	Fauth & Co	Repairing transit	28.75
Mar. 8	W. H. Wade	Salary	70.00
	Harry F. Hume	do	56.00
12	Geo. W. Pope et al	Pay roll	236.40
16	do	Traveling expenses	2.46
20	Walworth Construction and Supply Co	Valves	4.25
30	G. H. Parks	Salary	120.60
	Total, third quarter		11,839.09
Apr. 1	Baltimore and Ohio R. R. Co	Passenger transportation.	10.00
8	Harry F. Hume	Labor	52.00
	Wm. H. Wade	do	77.50
	Geo. W. Pope et al	Pay roll	261.80
12	do	Expenses	3.02
13	A. G. G. Richardson	do	2.60
	do	Traveling expenses	22.13
19	H. J. Harwood	Rent land	62.50
	The Garfield Land Association	do	450.00
	The Real Estate and Improvement Co. of Baltimore.	do	56.25
23	The Press Printing and Publishing Co	Advertising	2.25
25	The New York and New Jersey Telephone Co.	Telephone service	21.25
29	John Robinson	Repairing fences	22.50
30	G. H. Parks	Salary	115.40
May 3	Wm. H. Wade	do	74.20
8	Harry F. Hume	do	52.00
9	Conant & Co	Cement and putty	5.75
	Geo. W. Pope et al	Pay roll	351.17
16	do	Expenses	1.00
	do	Traveling expenses	9.57
	do	Expenses	.81
24	Warnaar & Van Der Hornven	Painting, etc	50.00
	Walworth Construction and Supply Co	Iron	2.71
28	G. H. Parks	Traveling expenses	11.90
31	do	Salary	119.20
June 4	Pennsylvania R. R. Co	Passenger transportation	10.00
	do	do	10.00
7	Wm. H. Wade	Salary	76.60
8	Geo. W. Pope et al	Salaries	685.47
12	Geo. W. Pope	Traveling expenses	6.41
	do	Expenses	.81
	do	do	3.75
	do	do	5.00
	Harry F. Hume	Salary	52.00
14	R. W. Burrell	Pipe	11.50
	David Tuers	Drilling well	210.63
21	The David Henry Building Co	Barn, Athenia, N. J	5,073.55
22	J. C. Philbrook	Horseshoeing	4.00
	The J. A. Van Winkle Co	Tools	11.51

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

ANIMAL QUARANTINE STATIONS—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
June 22	Chas. Hubinger	Tools	$29.90
25	Pennsylvania R. R. Co	Transportation	4.43
	Total, fourth quarter		8,033.07
	Supplemental.		
July 5	G. H. Parks	Traveling expenses	5.04
8	W. H. Wade	Salary	74.20
	Harry F. Hume	do	56.00
10	Geo. W. Pope et al	Salaries	706.45
	do	Traveling expenses	9.02
13	The David Henry Building Co	Barns at Athenia, N. J	7,894.52
16	Evening News Publishing Co	Advertising	6.60
18	do	do	7.20
	do	do	5.10
20	Press Printing and Publishing Co	do	2.44
	A. G. G. Richardson	Traveling expenses	20.63
23	Geo. W. Pope	Expenses	6.61
25	A. G. G. Richardson	do	1.50
	Geo. W. Pope	do	46.17
31	The David Henry Building Co	Work on pump	2.80
	The Anderson Lumber Co	Pipe and traps	20.61
	The New York and New Jersey Telephone Co.	Service	24.45
	Chas. Hubinger	Hardware	11.96
	The A. J. VanWinkle Co	Pipe fittings	7.49
	H. J. Harwood	Rent land	62.50
	The Real Estate and Improvement Co	do	56.25
Aug. 3	Jas. K. Kerr, jr	Traveling expenses	39.75
7	Geo. W. Pope	Expenses	33.00
	Total		9,100.29

RECAPITULATION.

First quarter	$10,466.32
Second quarter	9,397.82
Third quarter	11,839.09
Fourth quarter	8,033.07
Supplemental	9,100.29
Total	48,836.59

COLLECTING AGRICULTURAL STATISTICS.

Date.	Name.	Nature of payment.	Total.
1900.			
July 20	Washington city post-office	Stamps	$80.00
31	A. G. Rice et al	Salaries	4,242.77
Aug. 1	B. C. White	Salary	156.00
3	Edwin S. Holmes, jr	do	195.00
	E. T. Peters	do	52.50
11	L. C. Dorgan, jr	Services	25.00
	L. M. Erskine	do	50.00
	W. H. Pleasants	do	20.00
	Henry Hawkins	do	20.00
	C. Bollinger	do	25.00
	W. O. H. Shepard	do	20.00
13	B. C. White	Traveling expenses	119.34
18	Jno. L. Cantwell	Services	20.00
22	E. S. Holmes, jr	Traveling expenses	159.72
27	Jno. C. Parker	Record paper	62.50
31	A. G. Rice et al	Salaries	4,057.03
Sept. 4	B. C. White	Salary	162.00
5	E. S. Holmes, jr	do	202.50
	E. T. Peters	do	161.00
	B. C. White	Traveling expenses	79.20
7	The Journal of Commerce and Commercial Bulletin.	Yearbook, Vol. V	1.25
15	Henry Hawkins	Salary	20.00
	L. M. Erskine	do	50.00
	W. H. Pleasants	do	20.00
	L. C. Dorgan, jr	do	25.00
	Jno. L. Cantwell	do	20.00

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

COLLECTING AGRICULTURAL STATISTICS—Continued.

Date.	Name.	Nature of payment.	Total.
1900.			
Sept. 15	W. O. H. Shepard	Salary	$20.00
17	E. S. Holmes, jr	Traveling expenses	110.15
	Geo. K. Holmes	do	11.80
21	Houston and Texas Central R. R. Co	Passenger transportation	5.60
	Georgia R. R. Co	do	3.75
	The Western Rwy. Co. of Alabama	do	5.25
	Atlanta and West Point R. R. Co	do	14.85
22	C. Bollinger	Salary	25.00
29	Wells W. Miller	Services	200.00
	Kilbourn Harwood	do	200.00
	Geo. Husmann	do	200.00
	Jno. Cownie	do	200.00
	H. H. Green	do	175.00
	Levi Chubbuck	do	175.00
	F. E. Dawley	do	175.00
	R. W. Furnas	do	175.00
	P. A. Rogers	do	175.00
	T. J. Anderson	do	175.00
	S. Arthur Knapp	do	165.00
	C. H. Morse	do	150.00
	R. H. Thomas	do	150.00
	E. E. Kaufman	do	150.00
	E. F. Sherbel	do	150.00
	W. J. Northen	do	150.00
	Jas. H. Lane	do	137.50
	H. F. Simrall	do	137.50
	A. V. R. Snyder	do	125.00
	H. W. Desgranges	do	125.00
	J. J. Carley	do	125.00
	S. S. Shepard	do	125.00
	W. A. Withers	do	125.00
	T. H. Reeves	do	125.00
	W. A. Sherman	do	115.45
	J. A. Hayden	do	112.50
	Geo. W. Perry	do	112.50
	Jas. Shires	do	112.50
	D. B. Russell	do	112.50
	Wm. Nelson	do	100.00
	Homer W. Vail	do	75.00
	Edwd. Wiggin	do	75.00
	J. T. Cox	do	75.00
	J. A. Beal	do	75.00
	E. C. Hutchinson	do	75.00
	E. D. Howe	do	75.00
	C. L. Gold	do	75.00
	J. A. Tillinghast	do	75.00
	Jno. J. Rosa	do	75.00
	A. G. Rice et al	Salaries	3,806.95
	Total first quarter		19,204.61
Oct. 2	Ed. S. Holmes, jr	Salary	187.50
	B. C. White	do	150.00
3	E. T. Peters	do	140.00
5	Carl S. Scofield	do	40.76
	L. C. Dorgan, jr	do	25.00
	Jno. L. Cantwell	do	20.00
	C. Bollinger	do	25.00
	B. C. White	Traveling expenses	112.65
	Chicago, Milwaukee and St. Paul Rwy. Co	Passenger transportation	33.37
	Great Northern Rwy. Co	do	3.96
	Pennsylvania R. R. Co	do	8.30
	The Atchison, Topeka and Santa Fe Rwy. Co	do	18.95
	do	do	16.35
	Southern Rwy. Co	do	40.00
	Southern Pacific Co	do	10.85
	The Wabash R. R. Co	do	7.50
	The Lake Shore and Michigan Southern Rwy. Co.	do	7.00
	Baltimore and Ohio R. R. Co	do	12.75
9	Ed. S. Holmes, jr	Traveling expenses	171.78
16	Rudolph, West & Co	Knives	1.12
	D. Frank Parker	Mimeograph ink and paper	21.30
	W. H. Pleasants	Salary	20.00
	L. M. Erskine	do	50.00
	W. O. H. Shepard	do	20.00
	Earl Sloan	do	75.00
20	Jno. C. Parker	Manila paper	30.50
24	The Hocking Valley R. R. Co	Passenger transportation	3.70
	Chicago, Indianapolis and Louisville Rwy. Co.	do	5.00

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

COLLECTING AGRICULTURAL STATISTICS—Continued.

Date.	Name.	Nature of payment.	Total.
1900.			
Oct. 24	Northern Pacific Rwy. Co	Passenger transportation	$20.53
	Illinois Central R. R. Co	do	23.00
	Pittsburg, Cincinnati, Chicago and St. Louis Rwy. Co.	do	12.75
26	W. C. Duncan	Services	200.00
27	J. E. Pennybacker	Typewriting	2.00
30	Postal Telegraph Cable Co	Telegraph services	1.00
31	A. G. Rice et al	Salaries	4,146.88
Nov. 1	E. T. Peters	Salary	126.28
2	Library Bureau	Cards	28.00
	The Carter's Ink Co	Writing fluid	9.00
	The Chesapeake and Potomac Telephone Co.	Telephone rent	6.25
	Western Union Telegraph Co	Telegraph service	7.11
3	Edw. S. Holmes, jr	Salary	202.50
	B. C. White	do	162.00
	C. S. Scofield	do	84.20
5	Washington city post-office	Stamps	30.00
6	Houston, East and West Texas Rwy. Co	Passenger transportation	6.95
	Southern Pacific Co	do	10.85
	Southern Rwy. Co	do	17.50
	Missouri, Texas and Kansas Rwy. Co	do	7.15
	Houston and Texas Central R. R. Co	do	10.00
	The Chesapeake and Ohio Rwy. Co	do	17.00
	Michigan Central R. R. Co	do	5.00
7	W. H. Pleasants	Salary	20.00
	L. C. Dorgan, jr	do	25.00
	Jno. L. Cantwell	do	20.00
	Henry Hawkins	do	40.00
	L. M. Erskine	do	50.00
	C. Bollinger	do	25.00
	Richd. H. Lea	do	150.00
8	Earl Sloan	do	25.00
10	B. C. White	Traveling expenses	97.90
12	E. G. Ward	do	84.35
13	Edw. S. Holmes, jr	do	166.85
	W. F. T. Bushnell	Services	91.26
21	Jno. Hyde	Traveling expenses	291.60
22	W. O. H. Shepard	Salary	20.00
26	Jas. L. Morrison	Services	31.67
27	Wyckoff, Seamans & Benedict	Paper	64.70
30	A. G. Rice et al	Salaries	3,920.53
Dec. 1	Daniel E. Morton	Salary	12.23
	B. C. White	do	156.00
	Carl S. Scofield	do	81.60
3	E. Poole	Photographs Welland Canal	13.30
	D. Frank Parker	Typewriter ribbons, etc	153.30
	E. T. Peters	Salary	157.50
4	E. S. Holmes, jr	do	195.00
5	Wyckoff, Seamans & Benedict	Repairs to typewriter	11.50
	Chicago and Grand Trunk Rwy. Co	Passenger transportation	5.05
	Northern Pacific Rwy. Co	do	6.98
	The Chicago, Burlington and Quincy R. R. Co.	do	11.50
	Pennsylvania R. R. Co	do	21.00
	Baltimore and Ohio R. R. Co	do	12.75
	Pittsburg, Cincinnati, Chicago and St. Louis Rwy. Co.	do	5.30
	The Cleveland, Cincinnati, Chicago and St. Louis Rwy. Co.	do	5.30
	International Great Northern R. R. Co	do	31.15
	Chicago, Milwaukee and St. Paul Rwy. Co	do	42.00
	Southern Rwy. Co	do	27.50
6	C. Bollinger	Salary	25.00
	Jno. L. Cantwell	do	20.00
	L. M. Erskine	do	50.00
14	D. Frank Parker	Mimeograph	50.00
17	W. O. H. Shepard	Salary	20.00
	Henry Hawkins	do	20.00
18	Library Bureau	Clips	10.00
	E. G. Ward, jr	Traveling expenses	46.30
	B. C. White	do	82.25
19	L. C. Dorgan, jr	Salary	25.00
	Edwin S. Holmes	Traveling expenses	143.86
29	B. C. White	do	69.10
31	Wells L. Miller	Services	200.00
	Jno. Cownie	do	200.00
	H. H. Green	do	200.00
	W. C. Duncan	do	200.00
	Kilbourn Harwood	do	200.00
	Geo. Husmann	do	200.00

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

COLLECTING AGRICULTURAL STATISTICS—Continued.

Date.	Name.	Nature of payment.	Total.
1900.			
Dec. 31	R. W. Furnas	Services	$175.00
	Levi Chubbuck	do	175.00
	Plum A. Rogers	do	175.00
	T. J. Anderson	do	175.00
	F. E. Dawley	do	175.00
	S. A. Knapp	do	165.00
	E. F. Scherbel	do	150.00
	C. H. Morse	do	150.00
	E. E. Kaufman	do	150.00
	R. H. Thomas	do	150.00
	W. J. Northen	do	150.00
	Jas. H. Lane	do	137.50
	H. F. Simrall	do	137.50
	S. S. Shepard	do	125.00
	T. H. Reeves	do	125.00
	W. A. Withers	do	125.00
	J. J. Carley	do	125.00
	Z. W. Perry	do	112.50
	Jas. Shire	do	112.50
	J. A. Hayden	do	112.50
	S. J. Seal	do	112.50
	D. B. Russell	do	112.50
	Wm. Nelson	do	100.00
	E. D. Howe	do	75.00
	E. C. Hutchinson	do	75.00
	Jno. J. Rosa	do	75.00
	J. T. Cox	do	75.00
	D. E. Morton	do	75.00
	H. W. Vail	do	75.00
	J. A. Tillinghast	do	75.00
	Edward Wiggins	do	75.00
	C. L. Gold	do	75.00
	J. A. Beal	do	25.30
	E. T. Peters	do	147.00
	A. G. Rice et al	Salaries	3,975.35
	Total second quarter		22,278.49
1901.			
Jan. 2	Louisville and Nashville R. R. Co	Passenger transportation	9.59
	The Western Rwy. of Alabama	do	13.40
	The Yazoo and Mississippi Valley R. R. Co	do	6.60
	Southern Rwy. Co	do	18.15
	do	do	11.75
	A. V. R. Snyder	Salary	125.00
	Edw. S. Holmes	do	195.00
	B. C. White	do	156.00
3	Amberg File and Index Co	Cabinet	89.00
4	United States Envelope Co	Envelopes	539.04
	Carl S. Scofield	Salary	84.20
5	Jno. L. Cantwell	do	20.00
8	E. Bollinger	do	25.00
14	L. M. Erskine	do	50.00
	L. C. Dorgan, jr	do	25.00
	Henry Hawkins	do	20.00
	W. O. H. Shepard	do	20.00
	Z. D. Gilman	Reading glasses	5.00
16	Richd. H. Lea	Salary	150.00
21	United States Envelope Co	Envelopes	1,699.02
22	Jno. C. Parker	Letter paper	300.00
	The Maurice Joyce Engraving Co	Engraving	2.37
	O'Conor & Co	St. Louis Market Report	5.50
31	A. G. Rice et al	Salaries	4,128.88
Feb. 1	E. T. Peters	Salary	161.00
	Wm. H. Rupp	Seals, etc	17.00
	Valley Paper Co	Paper	13.00
	H. W. Desgranges	Salary	125.00
	B. C. White	do	162.00
2	Edw. S. Holmes, jr	do	157.50
4	Carl S. Scofield	do	86.10
6	Kansas City, Memphis and Birmingham R. R. Co.	Passenger transportation	12.50
	Yazoo and Mississippi Valley R. R. Co	do	6.80
	Georgia Railroad	do	5.13
	Chicago, Milwaukee and St. Paul Rwy. Co.	do	14.55
	Illinois Central R. R. Co	do	11.85
	Chicago, Indianapolis and Louisville Rwy. Co.	do	5.00
	Pittsburg, Cincinnati, Chicago and St. Louis Rwy. Co.	do	5.30

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

COLLECTING AGRICULTURAL STATISTICS—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
Feb. 6	Choctaw, Oklahoma and Gulf R. R. Co	Passenger transportation	$4.40
	Chicago and Northwestern Rwy. Co	do	8.10
	The Cleveland, Cincinnati, Chicago and St. Louis Rwy. Co.	do	8.90
	Chicago and Alton Rwy. Co	do	20.00
	do	do	7.70
	Michigan Central R. R. Co	do	24.20
	The Missouri Pacific R. R. Co	do	6.50
	The Pulman Co	do	3.00
	Pere Marquette R. R. Co	do	6.90
	New York, New Haven and Hartford R. R. Co.	do	10.00
	Southern Rwy. Co	do	23.00
	Pennsylvania R. R. Co	do	14.80
	do	do	8.30
	Baltimore and Ohio R. R. Co	do	25.50
7	L. C. Dorgan, jr	Salary	25.00
	C. Bollinger	do	25.00
	L. M. Erskine	do	50.00
	Jno. L. Cantwell	do	20.00
	Oswald Wilson	do	28.00
8	The Oliver Typewriter Co	Cleaning typewriter	3.90
	B. C. White	Traveling expenses	106.70
12	The Chesapeake and Potomac Telephone Co.	Telephone rent	6.25
13	W. H Rupp	Portfolio	5.50
14	W. O. H. Shepard	Salary	20.00
	Henry Hawkins	do	20.00
18	Oswald Wilson	Traveling expenses	11.75
20	Rich. H. Lea	Salary	50.00
21	Edw. S. Holmes, jr	Traveling expenses	164.00
27	Chicago, Rock Island and Pacific Rwy. Co	Passenger transportation	30.70
	C. S. Scofield	Expenses	64.12
	R. Carter Ballantyne	Paper	53.22
28	The R. H. Smith Manufacturing Co	Molding	28.33
	S. A. Nelson	Book	1.00
	E. S. Holmes, jr	Salary	161.00
	B. C. White	do	161.00
	A. G. Rice et al	Salaries	3,939.71
Mar. 1	E. T. Peters	Salary	154.00
2	Carl S. Scofield	do	77.80
5	B. C. White	Traveling expenses	83.15
9	C. Bollinger	Salary	25.00
	Oswald Wilson	do	168.00
	Henry Hawkins	do	20.00
	Jno. L. Cantwell	do	20.00
	L. C. Dorgan, jr	do	25.00
	W. O. H. Shepard	do	20.00
18	Library Bureau	Cases and cards	172.00
	Lemcke Buechner	Book	4.80
19	Washington City post-office	Stamps	30.00
20	L. M. Erskine	Salary	50.00
21	Richd. L. Lamb	Stamp pads	38.00
	Earle Sloan	Salary	100.00
25	United States Electric Lighting Co	Electric current	6.62
27	Edwin S. Holmes, jr	Traveling expenses	55.20
30	Wells W. Miller	Services	200.00
	H. H. Green	do	200.00
	W. C. Duncan	do	200.00
	Jno. Cownie	do	200.00
	Robt. W. Furnas	do	175.00
	P. A. Rogers	do	175.00
	T. J. Anderson	do	175.00
	F. E. Dawley	do	175.00
	Levi Chubbuck	do	175.00
	S. A. Knapp	do	165.00
	Geo. Husmann	do	164.43
	W. J. Northen	do	150.00
	R. H. Thomas	do	150.00
	E. E. Kaufmann	do	150.00
	C. H. Morse	do	150.00
	E. F. Scherbel	do	150.00
	Jas. H. Lane	do	137.50
	A. V. R. Snyder	do	104.12
	J. J. Corley	do	125.00
	H. W. Desgranges	do	125.00
	S. S. Shepard	do	125.00
	W. A. Withers	do	125.00
	G. W. Perry	do	112.50
	J. A. Hayden	do	112.50

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

COLLECTING AGRICULTURAL STATISTICS—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
Mar. 31	Jas. Shire	Services	$112.50
	D. B. Russell	do	112.50
	Wm. Nelson	do	100.00
	S. J. Seal	do	77.50
	E. D. Howe	do	75.00
	Edwd. Wiggens	do	75.00
	J. A. Tillinghast	do	75.00
	D. E. Morton	do	75.00
	H. W. Vail	do	75.00
	E. C. Hutchinson	do	75.00
	J. T. Cox	do	75.00
	Jno. J. Rosa	do	75.00
	C. L. Gold	do	75.00
	B. C. White	do	182.00
	A. G. Rice et al	Salaries	4,229.07
	Total third quarter		23,886.90
Apr. 1	Edwin S. Holmes, jr	Salary	175.00
	Pennsylvania Co	Passenger transportation	3.50
	Pere Marquette R. R. Co	do	3.20
	Baltimore and Ohio R. R. Co	do	11.30
	Southern Rwy. Co	do	37.70
	Pennsylvania R. R. Co	do	22.65
	New Orleans and Northeastern R. R. Co	do	20.10
	The Cleveland, Cincinnati, Chicago and St. Louis Rwy. Co.	do	7.50
	Seaboard Air Line Rwy. Co	do	19.35
3	B. C. White	Traveling expenses	101.60
	E. T. Peters	Salary	147.00
	Carl S. Scofield	do	86.10
4	The Hammond Typewriter Co	Shuttle	2.50
10	Jas. W. Wilson	Salary	140.00
	do	do	49.00
	do	Traveling expenses	123.09
	Jno. L. Cantwell	Salary	20.00
	C. Bollinger	do	25.00
	H. F. Simrall	do	137.50
	J. A. Beal	do	62.53
11	Oswald Wilson	Traveling expenses	16.05
	do	do	52.55
	do	Salary	182.00
12	Library Bureau	Cards	54.30
	do	Cards, etc	31.00
	Henry Hawkins	Salary	20.00
	L. M. Erskine	do	50.00
	L. C. Dorgan, jr	do	25.00
13	W. O. H. Shepard	do	20.00
22	Southern Rwy. Co	Passenger transportation	23.00
	The Pullman Co	do	16.50
	Yazoo and Mississippi Valley R. R. Co	do	11.85
	The Texas and Pacific Rwy. Co	do	42.75
24	Richd. H. Lea	Salary	100.00
29	B. C. White	Traveling expenses	104.17
30	E. S. Holmes, jr	Salary	182.00
	B. C. White	do	182.00
	A. G. Rice et al	Salaries	4,063.54
May 1	Sarah K. Harwood	Salary	100.00
2	E. T. Peters	do	126.00
	Carl S. Scofield	do	82.40
3	The Chesapeake and Potomac Telephone Co.	Telephone rent	6.25
4	Wyckoff, Seamans & Benedict	Card attachment	2.85
7	Jno. L. Cantwell	Salary	20.00
	C. Bollinger	do	25.00
8	Western Union Telegraph Co	Telegraph service	21.09
	do	do	15.11
	Edwin S. Holmes, jr	Traveling expenses	108.45
9	W. O. H. Shepard	Salary	20.00
	L. M. Erskine	do	50.00
	Oswald Wilson	do	182.00
11	L. C. Dorgan, jr	do	25.00
16	Church & Stephenson	Lumber	30.50
17	Rudolph, West & Co	Cupboard turns	3.24
20	Library Bureau	Cards	65.15
	C. S. Scofield	Traveling expenses	57.34
23	Washington City post-office	Stamps	8.00
24	Louis F. Sloan	Salary	10.83
	Earle Sloan	do	39.17
	Henry Hawkins	do	20.00

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

COLLECTING AGRICULTURAL STATISTICS—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
May 27	Louisville and Nashville R. R. Co	Passenger transportation	$10.60
	The Oregon R. R. and Navigation Co	do	10.90
	The Wabash R. R. Co	do	9.50
	Illinois Central R. R. Co	do	5.50
	Pennsylvania R. R. Co	do	25.50
	The Western Rwy. of Alabama	do	5.25
	Union Pacific R. R. Co	do	3.89
	Grand Trunk Rwy. System	do	10.10
28	Western Union Telegraph Co	Service	29.24
	do	do	38.32
	do	do	34.19
	do	do	59.90
	Wyckoff, Seamans & Benedict	Paper	9.30
	Edwd. G. Ward	Traveling expenses	11.50
	Western Union Telegraph Co	Service	1.07
29	United States Engraving Co	Daters	16.50
	Oswald Wilson	Traveling expenses	99.23
31	A. G. Rice et al	Salaries	4,357.17
June 1	B. C. White	Salary	182.00
	E. S. Holmes, jr	do	189.00
	Oswald Wilson	Traveling expenses	113.25
	do	Salary	189.00
	S. W. Halsey	do	69.23
3	H. E. Hooper, sr	Atlas	7.50
	The Journal of Commerce and Commercial Bulletin.	Yearbook	1.25
	G. G. Bradshaw	Services	10.00
	Kilbourn Harwood, deceased	Salary	51.11
4	Southern Rwy. Co	Passenger transportation	53.05
	Baltimore and Ohio R. R. Co	do	17.50
	E. T. Peters	Salary	171.50
5	H. Hawkins	do	20.00
	B. C. White	Traveling expenses	149.05
6	L. C. Dorgan, jr	Salary	25.00
	C. Bollinger	do	25.00
7	L. M. Erskine	do	50.00
8	E. S. Holmes, jr	Traveling expenses	146.85
10	Jno. L. Cantwell	Salary	20.00
11	W. O. H. Shepard	do	20.00
	W. H. Rupp	Fountain pens	4.00
	The Maurice Joyce Engraving Co	Engraving	.50
	D. Frank Parker	Typewriter supplies	109.60
13	Thos. B. Baldwin	Traveling expenses	33.75
	Rudolph, West & Co	Lock screws	5.26
14	Eberhard Faber Co	Bands	120.17
15	R. Carter Ballantyne	Envelopes	23.46
17	Richd. H. Lea	Salary	100.00
18	United States Envelope Co	Envelopes	437.97
	do	do	379.00
	C. S. Braisted	Pencils	30.00
21	Library Bureau	Trays	9.00
	Western Union Telegraph Co	Service	18.94
	do	do	6.09
	do	do	16.60
22	Washington City post-office	Stamps	9.00
25	Pere Marquette R. R. Co	Passenger transportation	6.40
	Pennsylvania Co	do	3.00
	Seaboard Air Line Rwy. Co	do	4.80
	Great Northern Rwy. Co	do	6.45
	Southern Rwy. Co	do	25.00
	Pennsylvania R. R. Co	do	6.00
	Southern Rwy. Co	do	13.50
28	Jas. B. Lambie	Hinges	1.28
29	Wells W. Miller	Services	200.00
	H. H. Green	do	200.00
	W. C. Duncan	do	200.00
	Jno. Cownie	do	200.00
	F. E. Dawley	do	175.00
	Levi Chubbuck	do	175.00
	R. W. Furnas	do	175.00
	T. J. Anderson	do	175.00
	Plum A. Rogers	do	175.00
	S. A. Knapp	do	165.00
	C. H. Morse	do	150.00
	E. F. Scherbel	do	150.00
	W. J. Northen	do	150.00
	R. H. Thomas	do	150.00
	E. E. Kaufman	do	150.00
	H. F. Simrall	do	137.50
	Jas. H. Lane	do	137.50

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

COLLECTING AGRICULTURAL STATISTICS—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
June 29	J. J. Corley	Services	$125.00
	S. S. Shepard	do	125.00
	W. A. Withers	do	125.00
	S. J. Seal	do	112.50
	G. W. Perry	do	112.50
	D. B. Russell	do	112.50
	James Shire	do	112.50
	J. A. Hayden	do	112.50
	Wm. Nelson	do	100.00
	Homer W. Vail	do	75.00
	D. E. Morton	do	75.00
	J. T. Cox	do	75.00
	Jno. J. Rosa	do	75.00
	J. A. Tillinghast	do	75.00
	Edw. Wiggin	do	75.69
	E. C. Hutchinson	do	75.00
	C. L. Gold	do	75.00
	E. D. Howe	do	75.00
	A. G. Rice et al	Salaries	4,504.94
	Total fourth quarter		24,088.37
	Supplemental.		
July 1	E. S. Holmes	Salary	175.00
2	Hugh Reilly	Glass	5.28
3	B. C. White	Salary	175.00
5	C. Bollinger	do	25.00
	Carl S. Scofield	do	41.20
	Thos. B. Baldwin	do	154.00
6	Mahlon T. Lighner	Services	100.50
	Oswald Wilson	Salary	175.00
8	Jno. L. Cantwell	do	20.00
	L. M. Erskine	do	50.00
	Henry Hawkins	do	20.00
	Richd. H. Lea	do	50.00
	Kilbourn H. Roby	do	237.78
9	Northern Pacific Rwy. Co	Passenger transportation	3.75
	Georgia R. R. Co	do	5.13
	Chicago and Northwestern Rwy. Co	do	4.94
11	Oswald Wilson	Traveling expenses	99.80
	Thos. B. Baldwin	do	75.90
	H. W. Desgranges	Salary	125.00
13	Edwd. S. Holmes, jr	Traveling expenses	150.25
	W. O. H. Shepard	Salary	20.00
17	B. C. White	Traveling expenses	125.90
19	The Railroad Gazette	Subscription	4.00
	The Railway Equipment and Publishing Co.	do	5.00
	The Journal of Commerce and Commercial Bulletin.	do	12.00
20	The Railway World Publishing Co	do	1.00
	D. O. Haynes & Co	do	8.00
	The Tuttle, Morehouse & Taylor Co	do	3.00
	Valley Paper Co	Paper	13.00
	Willett & Gray	Subscription	15.00
	National Railway Publishing Co	do	5.00
22	Windsor & Kenfield Publishing Co	do	1.00
	The University of Chicago Press	do	2.00
	T. B. Veblen	do	3.00
	The Railway Age and North Western Railroader.	do	4.00
	J. R. Commons	do	1.00
	Frank P. Bennett	do	1.00
	do	do	3.00
	Geo. H. Ellis	do	3.00
	Ginn & Co	do	3.00
23	Lemcke & Buechner	do	15.00
	do	do	6.50
	Trade Publishing Co	do	.50
	E. L. Powers Co	do	3.00
26	Baltimore & Ohio R. R. Co	Passenger transportation	12.75
	Northern Pacific Rwy. Co	do	3.80
29	B. W. Rowley	Subscription	2.00
30	Jno. C. Parker	Supplies	126.29
	The Fruit World Publishing Co	Subscription	1.00
Aug. 1	Carl S. Scofield	Traveling expenses	46.98
	R. Carter Ballantyne	Pens	12.63
2	Curtis, Guild & Co	Subscription	4.00
	The Cleveland, Cincinnati, Chicago and St. Louis Rwy. Co.	Passenger transportation	7.50

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

COLLECTING AGRICULTURAL STATISTICS—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
Aug. 2	Louisville and Nashville R. R. Co	Passenger transportation	$37.09
	The Western Rwy. of Alabama	do	5.25
	The Hocking Valley Rwy. Co	do	61.00
	Chicago, Rock Island and Texas Rwy. Co	do	6.30
	Seaboard Air Line Rwy. Co	do	13.95
	The Wabash R. R. Co	do	9.87
	The Yazoo and Mississippi Valley R. R. Co	do	6.60
	Southern Rwy. Co	do	3.50
	do	do	7.45
	do	do	58.25
3	Jno. C. Parker	Letter paper	117.60
5	Chicago and Alton Rwy. Co	Passenger transportation	4.75
	International and Great Northern R. R. Co	do	9.70
	The Missouri Pacific Rwy. Co	do	9.70
6	E. E. Billow	Subscription	5.00
12	Rudolph, West & Co	Cupboard turns	3.24
	The Geo. W. Knox Express Co	Transportation	1.95
	J. E. Beerbohm	Subscription	29.20
20	Orange Judd Co	do	1.00
21	The Chesapeake and Potomac Telephone Co.	Service	6.25
22	The Hawaiian Gazette Co	Subscription	1.25
Oct. 3	Louis F. Sloan	Salary	50.00
4	Georgia R. R. Co	Passenger transportation	12.15
	Seaboard Air Line	do	11.75
	Gulf, Colorado and Santa Fe Rwy. Co	do	7.10
	The Oregon R. R. and Navigation Co	do	11.05
	The Texas and Pacific Rwy. Co	do	9.60
	Oregon Short Line R. R. Co	do	34.50
	Chicago, Milwaukee and St. Paul Rwy. Co	do	12.75
	The Chicago, Burlington and Quincy R. R. Co.	do	7.05
	Southern Rwy. Co	do	3.25
	The Chesapeake and Ohio Rwy. Co	do	27.75
	Great Northern Rwy. Co	do	10.40
	Northern Pacific R. R. Co	do	10.40
8	Thos. Cook & Son	do	180.23
	do	do	113.50
	do	do	105.00
	do	do	98.00
12	Postal Telegraph Cable Co	Service	4.75
	Total		3,276.49

RECAPITULATION.

First quarter	$19,204.61
Second quarter	22,278.49
Third quarter	23,886.90
Fourth quarter	24,088.27
Supplemental	3,276.49
Total	92,734.76

INVESTIGATING FOREIGN DEMANDS FOR UNITED STATES AGRICULTURAL PRODUCTS.

Date.	Name.	Nature of payment.	Total.
1900.			
July 31	F. H. Hitchcock et al	Salary	$734.80
Aug. 21	E. S. Newman	Paper	6.00
27	Jno. C. Parker	Binding cases	3.50
31	F. H. Hitchcock et al	Salaries	714.80
Sept. 5	Wyckoff, Seamans & Benedict	Copying ribbons	3.50
7	The Press Clipping Bureau	Clippings	3.39
18	do	do	1.98
29	F. H. Hitchcock et al	Salaries	675.40
	Total first quarter		2,143.37
Oct. 15	The Press Clipping Bureau	Clippings	1.68
23	The Spectator Co	Arithmometer	400.00

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

INVESTIGATING FOREIGN DEMANDS FOR UNITED STATES AGRICULTURAL PRODUCTS—Continued.

Date.	Name.	Nature of payment.	Total.
1900.			
Oct. 31	F. H. Hitchcock et al	Salaries	$729.80
Nov. 2	United States Envelope Co	Envelopes	48.00
	The Chesapeake and Potomac Telephone Co.	Telephone rent	4.14
26	F. H. Hitchcock	Traveling expenses	19.85
30	F. H. Hitchcock et al	Salaries	687.90
Dec. 3	The Press Clipping Bureau	Clippings	1.32
14	....do	....do	1.47
17	E. S. Newman	Paper and ribbons for adding machine.	9.00
29	S. P. Johnson	Typewriter, etc	62.50
31	F. H. Hitchcock et al	Salaries	774.37
	Total second quarter		2,740.03
1901.			
Jan. 18	W. B. Moses & Sons	Bookcase	18.00
19	The Press Clipping Bureau	Clippings	1.08
22	Jno. C. Parker	Letter press	22.72
31	F. H. Hitchcock et al	Salaries	730.30
Feb. 11	The Press Clipping Bureau	Clippings	3.09
	W. B. Moses & Sons	Bookcase units	9.00
	Brentanos	Statistical books	67.95
12	The Chesapeake and Potomac Telephone Co.	Telephone rent	6.25
28	F. H. Hitchcock et al	Salaries	759.40
Mar. 12	The Press Clipping Bureau	Clippings	5.82
23	United States Envelope Co	Envelopes	96.00
30	F. H. Hitchcock et al	Salaries	822.80
	Total third quarter		2,542.41
Apr. 6	Jno. C. Parker	Envelopes, etc	51.00
12	The Spectator Co	Arithmometer	400.00
19	The Press Clipping Bureau	Clippings	3.21
30	F. H. Hitchcock et al	Salaries	816.10
May 1	E. S. Newman	Ribbons for adding machine	3.00
3	The Chesapeake and Potomac Telephone Co.	Telephone rent	6.25
13	The Press Clipping Bureau	Clippings	1.56
	Wyckoff, Seamans & Benedict	Ribbons	6.00
16	E. S. Newman	Burroughs registering accountant.	350.00
	....do	Arithmometer paper	3.00
31	F. H. Hitchcock et al	Salaries	832.80
June 15	Houghton & Delano	Films	7.00
18	Pearre E. Crowl Co	Stamp gum	52.38
	Houghton & Delano	Camera	15.25
22	Grant Carpenter	Adjusting arithmometer	18.00
	Total fourth quarter		2,565.55
	Supplemental.		
July 5	Adams Express Co	Transportation	2.06
9	Houghton & Delano	Films	8.40
	E. S. Newman	Paper and ribbon for adding machine.	5.50
Aug. 21	The Chesapeake and Potomac Telephone Co.	Rent	6.25
30	The Press Clipping Bureau	Clippings	1.20
	Total		23.41

RECAPITULATION.

First quarter	$2,143.37
Second quarter	2,740.03
Third quarter	2,542.41
Fourth quarter	2,565.55
Supplemental	23.41
Total	10,014.77

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

BOTANICAL INVESTIGATION AND EXPERIMENTS.

Date.	Name.	Nature of payment.	Total.
1900.			
July 20	G. W. Moss	Passenger transportation	$75.20
31	V. K. Chesnut et al	Salaries	1,516.76
Aug. 1	S. S. Boyce	Salary	51.61
10	L. H. Dewey	Traveling expenses	50.83
11	O. F. Cook	Salary	168.50
	E. R. Lake	do	150.00
14	Will W. Tracy, jr	Expenses	49.50
21	Washington Gaslight Co	Gas	1.20
	United States Electric Lighting Co	Lighting	4.35
24	Jno. C. Parker	Shannon binding case	1.25
25	Z. D. Gilman	Pressure tubing	1.80
	A. J. Pieters	Seeds	16.98
	M. G. Kains	Traveling expenses	62.39
29	Thos. Somerville & Sons	Pump, pipe, etc	66.82
31	V. K. Chesnut et al	Salaries	1,509.60
Sept. 4	S. S. Boyce	Salary	100.00
5	O. F. Cook	do	168.50
	Chicago House Wrecking Co	Roofing	17.50
	Rudolph, West & Co	Hose, etc	19.54
	Carl S. Scofield	Traveling expenses	185.82
	E. R. Lake	Salary	150.00
7	Z. D. Gilman	Tubing, etc	3.68
	Carter, Rice & Co. Corpn	Oak tag	2.10
	Whithall Tatum & Co	Tubing, etc	1.62
	Houghton & Delano	Photo supplies	9.43
	do	do	8.00
	Edw. S. Schmidt	Labels	3.75
12	United States Electric Lighting Co	Electric current	1.43
	Washington Gaslight Co	Gas	1.90
	Ernest Betz	Copper trays, etc	21.00
	Chas. Becker	Linseed oil	6.00
15	Houghton & Delano	Films	5.40
	F. W. Bolgiano	Farm wagon	49.75
17	Jas. B. Lambie	Nails, etc	6.52
19	Rudolph, West & Co	Hardware	20.76
21	Atlanta and West Point R. R. Co	Passenger transportation	5.25
	Southern Rwy. Co	do	33.00
	do	do	5.80
24	Library Bureau	Index cards	14.40
	Will W. Tracy, jr	Expenses	37.95
29	V. K. Chesnut et al	Salaries	1,364.16
	Total first quarter		5,970.05
Oct. 2	S. S. Boyce	Salary	100.00
	O. F. Cook	do	163.00
3	Ernest Betz	Making germinating chamber	85.00
4	E. R. Lake	Salary	150.00
	Bausch & Lomb Optical Co	Triplet	5.35
5	The Atchison, Topeka and Santa Fe Rwy. Co.	Passenger transportation	16.85
	Southern Rwy. Co	do	18.50
	Atlanta Coast Line R. R. Co	do	12.25
	do	do	21.16
	Norfolk and Washington, D. C., Steamboat Co.	do	3.00
	Florida East Coast Rwy. Co	do	33.95
	Keokuk and Western R. R. Co	do	6.15
	Pennsylvania R. R. Co	do	22.60
9	L. H. Dewey	Traveling expenses	61.36
10	R. Carter Ballantyne	Maps	.91
16	E. R. Lake	Traveling expenses	46.09
	do	do	28.05
	Flint & Walling Manufacturing Co	Tank	25.85
	Houghton & Delano	Seed plates	2.82
	United States Electric Lighting Co	Electric current	1.31
	Washington Gaslight Co	Gas	1.20
18	S. S. Boyce	Salary	48.39
20	Church & Stephenson	Lumber	114.00
24	Southern Rwy. Co	Passenger transportation	17.50
	do	do	3.88
	Chicago and Northwestern Rwy. Co	do	8.48
	Thos. Cook & Son	do	92.83
	do	do	51.17
	Cincinnati, New Orleans, and Texas Pacific Rwy. Co.	do	2.45
	The Western Rwy. of Alabama	do	17.92
	Alabama Midland Rwy. Co	do	14.00
	Southern Pacific Co	do	14.70
	do	do	8.15

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

BOTANICAL INVESTIGATION AND EXPERIMENTS—Continued.

Date.	Name.	Nature of payment.	Total.
1900.			
Oct. 26	U. M. Steward	Clover seed	$3.00
30	Geo. F. Muth & Co	Lead, etc	6.35
	Thos. Somerville & Sons	Pipe, ete	17.44
	Houghton & Delano	Plates	4.68
	do	do	12.42
	Edw. S. Schmidt	Rabbits	2.00
	do	Nicotine	1.50
	do	Sprinkler	1.00
	Mackall Bros	Chemicals	4.25
	F. P. May & Co	Knife	1.00
31	V. K. Chestnut et al	Salaries	1,251.62
Nov. 2	The Chesapeake and Potomac Telephone Co.	Telephone service	10.39
3	E. R. Lake	Salary	150.00
	O. F. Cook	do	168.50
5	Vera K. Charles	Report on seed coat	150.00
6	Thos. Cook & Son	Passenger transportation	83.30
	Gulf, Colorado and Santa Fe Rwy. Co	do	10.30
	The Chesapeake and Ohio Rwy. Co	do	14.55
10	A. J. Pieters	Traveling expenses	121.72
16	The Randolph Paper Box Co	Pamphlet cases	6.90
17	Church & Stephenson	Lumber	8.08
	M. Du Perow	Cells	1.70
	The Warren W. Biggs Heating and Ventilating Co.	Repairs to boiler	105.00
19	Houghton & Delano	Photo supplies	7.77
20	Fred. A. Schmidt	Cross-section paper	1.16
	Will. W. Tracy, jr	Expenses	32.50
22	F. A. Walpole	Traveling expenses	205.20
23	Wm. H. Rupp	Perforator	.25
	W. R. Beattie	Expenses	16.03
27	Z. D. Gilman	Naphthaline	.24
	The Geo. W. Knox Express Co	Transportation	.77
	United States Electric Lighting Co	Electric current	.65
	Washington Gaslight Co	Gas	2.40
28	L. H. Dewey	Traveling expenses	124.50
30	V. K. Chestnut et al	Salaries	1,168.40
Dec. 1	E. R. Lake	Salary	150.00
	O. F. Cook	do	163.00
3	Rochester Optical and Camera Co	Repairs to premo	6.50
	Houghton & Delano	Photo supplies	10.20
	do	Seed plates	2.82
	W. S. Thompson	Isinglass plaster	.60
	E. Morrison Paper Co	Tag-board paper	3.50
5	Thos. Somerville & Sons	Pipe, etc	112.46
	Thos. Cook & Son	Passenger transportation	6.50
	Baltimore and Ohio R. R. Co	do	9.00
	do	do	17.00
	Union Pacific R. R. Co	do	5.67
	Chicago and Northwestern Rwy. Co	do	8.10
6	Vera K. Charles	Report on seed coats	100.00
11	Mary Gannett	Mounting plants	5.70
15	Edgar Brown	Traveling expenses	5.45
17	Z. D. Gilman	Forceps	.75
	E. R. Lake	Traveling expenses	285.83
	do	do	213.51
	Houghton & Delano	Solio paper	12.05
19	Chas. Becker	Oil	3.00
	The Standard Brick Co	Brick	4.25
21	United States Electric Co	Electric current	2.68
	Washington Gaslight Co	Gas	4.00
29	F. V. Coville	Traveling expenses	31.10
	Adams Bros	Ventilator elbows	5.00
	Jas. B. Lambie	Iron, bolts, etc	4.30
31	V. K. Chesnut et al	Salaries	1,196.90
	Total second quarter		7,263.04
1901.			
Jan. 2	Baltimore and Ohio R. R. Co	Passenger transportation	13.50
	Louisville and Nashville R. R. Co	do	12.40
	Pennsylvania Co	do	11.75
	Illinois Central R. R. Co	do	9.40
	Cincinnati, Hamilton and Dayton Rwy. Co	do	6.00
	Chicago Great Western Rwy. Co	do	8.00
	Pennsylvania R. R. Co	do	17.00
3	J. H. Bunnell & Co	Silk cord	3.00
	Seabury & Johnson	Silk ising	7.50
	E. R. Lake	Traveling expenses	128.10
	do	Expenses	53.31

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

BOTANICAL INVESTIGATION AND EXPERIMENTS—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
Jan. 4	E. R. Lake	Salary	$150.00
	O. F. Cook	do	168.50
7	Church & Stephenson	Lumber	11.00
	United States Express Co	Transportation	11.21
12	Ernest Betz	Making oven	30.00
	H. M. Pieters	Abstract	5.00
	F. A. Walpole	Traveling expenses	25.35
14	Rudolph, West & Co	Hose, etc	13.00
	Mackall Bros	Soda, etc	1.92
16	Carl Purdy	Bulbs	.85
	Washington Gaslight Co	Gas	3.50
	United States Electric Lighting Co	Electric current	8.17
19	Manhattan Electrical Supply Co	Wire	.83
21	Whithall, Tatum & Co	Glass tubing	1.50
	Library Bureau	Cards, etc	17.00
	do	Pamphlet boxes	1.68
22	National Electrical Supply Co	Sockets	2.19
24	Thos. W. Smith	Hot-bed sash	5.20
26	E. V. Wilcox	Traveling expenses	60.45
29	Edward S. Schmid	Labels	3.75
30	Conrad Becker	Straps	4.80
	Woodward & Lothrop	Canton flannel	1.80
31	V. K. Chestnut et al	Salaries	1,214.13
Feb. 1	B. F. Starr & Co	Bolting cloth	1.05
	Felix Potin & Cie	Fruit	19.36
2	Houghton & Delano	Plates, etc	5.28
	O. F. Cook	Salary	172.20
5	J. M. Buisson	Prunes	8.57
	Blue Line Transfer Co	Transportation	3.16
6	The Lake Shore and Michigan Southern Rwy. Co.	Passenger transportation	4.50
	The Wabash R. R. Co	do	9.50
	Pere Marquette R. R. Co	do	2.88
	Pennsylvania Co	do	17.50
	Warren M. Whyte	Label holders	7.00
8	W. M. Galt & Co	Hay	16.50
	Mackall Bros	Chemicals	5.60
11	The Draper Manufacturing Co	Thermometer chart	1.56
	W. H. Larman	Boiler	49.50
12	Bausch & Lomb Optical Co	Glass, etc	4.50
	J. A. Pierpoint	Tin boxes	3.50
	Carter, Rice & Co. Corporation	Tag board	10.50
	The Chesapeake and Potomac Telephone Co.	Telephone rent	12.50
16	A. J. Pieters	Expenses	9.30
18	Chas. Becker	Glass	7.00
19	Vera K. Charles	Report	75.00
	B. F. Bush	Seeds	10.40
23	Houghton & Delano	Photo supplies	1.60
26	Richard L. Lamb	Stamp holder	2.10
	Geo. F. Muth & Co	Glass	.50
	W. H. Rupp	Calendar stand, etc	1.50
	John C. Parker	Pencil pointer	3.50
	Thos. Somerville & Sons	Cement, etc	7.00
	United States Electric Lighting Co	Lamps	1.60
	do	Electric current	5.45
	Washington Gaslight Co	Gas	3.30
27	Chicago, Rock Island and Pacific Rwy. Co	Passenger transportation	6.15
	A. A. Heller	Catalogue plants	1.45
	Adams Express Co	Transportation	7.02
28	The Florists' Exchange	Directory	2.00
	V. K. Chesnut et al	Salaries	1,101.85
Mar. 1	Thos. Somerville & Sons	Fittings	17.25
	O. F. Cook	Salary	155.60
13	Woodward & Lothrop	Velvet	1.15
14	E. J. Pullman	Photo paper	3.00
	Rudolph, West & Co	Gutter, etc	7.83
18	Will. W. Tracy, jr	Expenses	41.67
	E. R. Lake	Traveling expenses	32.27
	Library Bureau	File cases	1.70
19	The Geo. W. Knox Express Co	Transportation	4.65
	do	do	3.69
21	Church & Stephenson	Lumber	6.79
23	Eimer & Amend	Pans	1.43
	Robt. Smith Printing Co	Scrapbooks	4.00
	Merck & Co	Sapotoxin, etc	4.00
25	Edgar Brown	Traveling expenses	8.55
	Washington Gaslight Co	Gas	4.50
	United States Electric Lighting Co	Electric current	.17

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

BOTANICAL INVESTIGATION AND EXPERIMENTS—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
Mar. 25	The Chesapeake and Potomac Telephone Co.	Telephone services	$0.15
30	V. K. Chesnut et al	Salaries	1,248.70
	Total third quarter		5,160.77
Apr. 1	O. F. Cook	Salary	172.20
	do	Traveling expenses	18.60
	Jno. C. Parker	Wax paper, etc	2.45
	New Orleans and Northeastern R. R. Co	Passenger transportation	27.50
	Pere Marquette R. R. Co	do	4.75
2	E. J. Pullman	Photo paper	2.65
	do	Blue paper	1.00
	Wm. H. Dyer	File boxes	6.00
	W. M. Galt & Co	Hay	8.91
	Geo. Cogar & Co	Seeds	3.20
	M. A. Seed Dry Plate Co	Films	2.94
3	A. J. Pieters	Expenses	15.53
	Library Bureau	Cards, etc	1.90
	Bausch & Lomb Optical Co	Triplet's reading glasses	17.22
	D. T. MacDougal	Index cards	3.56
9	Thos. Somerville & Sons	Steam gauge	8.25
17	Homer Bowers	Plants	4.00
20	Houghton & Delano	Plates and paper	6.59
	L. S. Depue	Oats	7.75
	United States Electric Lighting Co	Electric current	14.42
	Washington Gaslight Co	Gas	4.40
	New York, Susquehanna and Western R. R. Co.	Transportation	33.00
	Blue Line Transfer Co	do	1.22
24	F. W. Bolgiano	Fertilizer	16.80
25	V. K. Chestnut	Traveling expenses	48.20
	do	Expenses	5.40
	Fred. A. Schmidt	Pencil and pads	4.60
27	United States Express Co	Transportation	15.78
	Adams Express Co	do	19.56
30	V. K. Chestnut et al	Salaries	1,256.90
May 1	Paul Hiser, jr., & Bro	Pots	8.50
	E. Morrison Paper Co	Binders' board	4.00
2	J. Burtt Davy	Plants	7.50
	O. F. Cook	Salary	164.80
3	V. K. Charles	Report and mounted slides	100.00
	The Chesapeake and Potomac Telephone Co.	Telephone rent	12.50
4	W. M. Galt & Co	Hay	8.38
8	Western Union Telegraph Co	Telegraph service	1.13
16	United States Electric Lighting Co	Electric current	10.43
	Mackall Bros	Laboratory supplies	7.97
	do	Alcohol	1.13
	W. M. Whyte	Zinc labels	3.00
17	Church & Stephenson	Cedar posts	34.50
	do	Lumber	23.53
	do	do	16.94
	do	do	5.15
	Thos. Somerville & Son	Tin pipe	4.00
24	Chas. L. Smith	Books	3.70
	F. A. Walpole	Traveling expenses	27.85
	Bausch & Lomb Optical Co	Bottles, etc	4.65
	Eimer & Amend	Hydrometer	1.00
28	Western Union Telegraph Co	Service	2.19
	Ethel Snell	Book	1.00
	E. J. Pullman	Albuma paper	1.25
	Fred V. Coville	Traveling expenses	7.10
	Fred. A. Schmidt	Pencils	1.10
31	V. K. Chestnut et al	Salaries	1,428.54
June 3	M. G. Kains	Salary	52.75
	O. F. Cook	do	170.40
4	Baltimore and Ohio R. R. Co	Passenger transportation	78.25
	Washington Gaslight Co	Gas	3.40
7	V. K. Chesnut	Traveling expenses	84.77
	do	do	40.16
11	E. Morrison Paper Co	Driers, etc	23.25
	J. A. Pierpoint	Tin boxes	17.50
	Woodward & Lothrop	Jars	13.50
	F. W. Bolgiano	Plow, etc	12.25
	Lamb Wire Fence Co	Wire fence	57.60
	Edwd. S. Schmidt	Plant stakes	3.00
	Leidy S. Depue	Oats	13.20
	do	do	12.40
	Jas. S. Topham	Camera case, etc	16.50

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

BOTANICAL INVESTIGATION AND EXPERIMENTS—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
June 12	Church & Stephenson	Lumber	$20.25
13	Jno. B. Lord	Sand	6.30
14	Eimer & Amend	Weights	.83
	do	Hydrometers	5.25
	do	Glass tubes	4.00
	do	Chemicals	1.35
	Henry J. Green	Thermometers	4.50
	Parke Davis & Co	Chloretone	11.75
	Whitall Tatem & Co	Jars, etc	.54
	Rochester Optical and Camera Co	Holders, etc	5.35
15	C. Becker	Leather straps	9.00
	Thos. Somerville & Son	Tank	4.00
17	Fredk. Carl	Camera attachment	36.25
21	Vera K. Charles	Report and drawings	125.00
	Western Union Telegraph Co	Service	.70
	do	do	1.88
22	Jas. S. Topham	Case	8.00
24	Houghton & Delano	Photo supplies	56.79
	do	Prints	7.90
	V. K. Chesnut	Traveling expenses	50.00
25	do	Expenses	19.65
	Ernest Betz	Repairs	3.55
	New York and Porto Rico Steamship Co	Passenger transportation	50.00
	The Chesapeake and Ohio Rwy. Co	do	76.75
27	United States Electric Lighting Co	Electric current	1.90
	Washington Gaslight Co	Gas	2.70
	Jas. S. Topham	Case	6.00
28	Rudolph, West & Co	Wire netting, etc	65.49
	F. W. Bolgiano	Plaster	6.50
29	V. K. Chesnut et al	Salaries	1,504.70
	Total fourth quarter		6,322.93
	Supplemental.		
1901.			
July 5	Vera K. Charles	Report and drawings	50.00
	Adams Express Co	Transportation	1.00
	do	do	17.90
	M. G. Kains	Salary	98.90
6	W. R. Beattie	Expenses	32.71
8	Western Electric Co	Adjusting thermometer	21.50
	do	Thermometer coils	4.00
	Rochester Optical and Camera Co	Slides	2.10
	Eimer & Amend	Hydrometer and express	1.05
9	Bausch & Lomb Optical Co	Nose piece	.75
	Thos. W. Smith	Stakes	27.00
16	A. J. Pieters	Expenses	15.43
	do	do	6.58
	do	Traveling expenses	4.17
17	Church & Stephenson	Lumber	8.64
	Houghton & Delano	Photograph supplies	30.15
	Sheets & Bishop	Tripod, etc	8.20
	L. S. Depue	Oats	16.50
	J. T. Walker's Sons	Sand	1.25
	Houghton & Delano	Photograph supplies	24.50
18	W. J. Gerhard	Botanical publications	2.75
19	Robt. F. Griggs	Salary	39.60
	United States Electric Lighting Co	Electric light	1.57
	Washington Gaslight Co	Gas	2.10
	United States Express Co	Transportation	7.71
22	Edgar Brown	Traveling expenses	100.37
26	Northern Pacific Rwy. Co	Transportation	25.65
29	F. V. Coville	Expenses	57.72
	Will. W. Treacy	do	26.45
	Edgar Brown	do	10.64
	C. L. Smith	Books	140.00
30	Jno. C. Parker	Record book	2.75
Aug. 2	R. Carter Ballantyne	Labels	1.00
	E. Morrison Paper Co	Blotting paper	3.50
	Pennsylvania R. R. Co	Passenger transportation	6.50
	Pacific Clipper Line	do	75.00
3	Mackall Bros	Chemicals	116.48
8	Thos. Taylor, M. D	Labels	35.00
12	The Geo. W. Knox Express Co	Transportation	5.40
17	Robt. F. Griggs	Traveling expenses	93.47
	Vera K. Charles	Expressage	1.00
21	F. A. Walpol	Traveling expenses	12.00
	The Chesapeake and Potomac Telephone Co.	Rent	12.50
23	V. K. Chesnut	Traveling expenses	64.85
	do	Expenses	133.97

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

BOTANICAL INVESTIGATION AND EXPERIMENTS—Continued.

Date.	Name.	Nature of payment.	Total.
	Supplemental—Continued.		
1901.			
Aug. 29	Guy N. Collins	Expenses	$9.45
Sept. 21	Mexico Commercial Co	Transportation	88.46
Oct. 2	Wm. Ballantyne & Sons	Books	42.72
5	Northern Pacific Rwy. Co	Passenger transportation	5.20
12	Postal Telegraph Cable Co	Service	6.82
	Total		1,502.96

RECAPITULATION.

First quarter	$5,970.05
Second quarter	7,263.04
Third quarter	5,160.77
Fourth quarter	6,322.93
Supplemental	1,502.96
Total	26.219.75

BOTANICAL INVESTIGATION AND EXPERIMENTS.

[Appropriation for 1900–01.]

Date.	Name.	Nature of payment.	Total.
1900.			
June 22	A. J. Pieters	Traveling expenses	$33.79
23	E. Morrison Paper Co	Mailing tubes	.95
30	A. J. Pieters et al	Salaries	1,229.70
	Total fourth quarter, 1900		1,264.44
July 2	Henry H. Brown	Kodak, etc	33.45
10	Thos. H. Kearney, jr	Traveling expense	9.17
13	Henry J. Green	Thermometer	3.00
	Whitall, Tatum & Co	Vials	25.94
	Washington Gaslight Co	Gas	2.00
	E. Morrison Paper Co	Mailing tubes	6.65
16	United States Electric Lighting Co	Electric current	3.75
19	S. H. Moore	Set portfolios	5.75
23	Henry Lindemeyr & Sons	Newspaper	7.73
28	Houghton & Delano	Solio paper	4.25
Aug. 1	Eimer & Amend	Tripod, etc	2.88
	do	Weights	.80
	E. Morrison Paper Co	Herbarium paper	45.00
3	Houghton & Delano	Solio paper	3.90
10	Carter, Rice & Co. (Corporation)	Paper	21.00
	The Springer Torsion Balance Co	Metric beam	15.50
	Whitall, Tatum & Co	Copper wire, etc	1.17
	do	Shell vials and corks	24.42
	Eimer & Amend	Reagent bottles, etc	4.40
	Houghton & Delano	Kodak films	5.40
	do	Seed plates	3.51
	The Draper Manufacturing Co	Thermometers	20.00
	Eberbach & Son	Gas regulator	4.00
14	G. A. Shehan	Lumber	6.93
	E. Morrison Paper Co	Mailing tubes	1.43
	J. A. Pierpoint	Tin boxes	17.50
	Henry H. Brown	Films	8.82
	Rudolph, West & Co	Hardware	2.59
25	Geo. P. Killian Co	Paper boxes	16.50
29	M. Du Perow	Fans	52.50
Sept. 5	Wyckoff, Seamans & Benedict	Adjusting typewriter	.60
7	United States Envelope Co	Envelopes	17.94
	Whitall, Tatum & Co	Vials	4.27
	The Randolph Paper Box Co	Boxes	97.50
17	Chas. P. Edmonston	Teakettle and pan	2.00
	Henry J. Green	Thermometers	18.00
	Total first quarter 1901		500.25
Oct. 1	Mackall Bros	Glycerin	4.40
5	The Chesapeake & Ohio Rwy. Co	Passenger transportation	31.50
15	Bausch & Lomb Optical Co	Micro-planar flange	30.00
30	Wm. H. Rupp	Envelopes	5.64
	Total second quarter		71.54

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

BOTANICAL INVESTIGATION AND EXPERIMENTS—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
Jan. 15	W. H. Butler	Glass	$7.92
Feb. 18	Wagner Typewriter Co	Typewriter	62.50
Mar. 18	Lemcke & Buechner	Botanical publication	4.90
21	W. H. Lowman	Smokestack	6.00
	Total third quarter		81.32
Apr. 2	Mackall Bros	Chemicals	2.21
June 14	Lemcke & Buechner	Botanical publication	11.23
	Total fourth quarter		13.44
	Supplemental.		
1901.			
July 5	B. H. Warner	Land rent	50.00

RECAPITULATION.

Fourth quarter, 1900	$1,264.44
First quarter, 1901	500.25
Second quarter, 1901	71.54
Third quarter, 1901	81.32
Fourth quarter, 1901	13.44
Supplemental	50.00
Total	1,980.99

RENT OF BUILDING.

Date.	Name.	Nature of payment.	Total.
1900.			
Oct. 6	Jane E. Howlett	Rent, first quarter	$180.00
1901.			
Jan. 5	do	Rent, second quarter	180.00
Apr. 2	do	Rent, third quarter	180.00
	Supplemental.		
July 16	Jane E. Howlett	Rent, fourth quarter	180.00
	Total		720.00

ENTOMOLOGICAL INVESTIGATIONS.

1900.			
July 23	L. H. Harvey	Set of slides	$10.00
24	L. O. Howard	Traveling expenses	7.80
31	E. A. Schwarz et al	Salaries	1,351.30
Aug. 1	The Publishers and Printers' Engraving Co	Engraving of insects	1.75
	do	do	2.73
	Addie L. Harvey	Specimens of Odonata	11.45
14	Mackall Bros	Alcohol, etc	10.68
	Z. D. Gilman	Flint bottles	3.00
17	F. C. Pratt	Traveling expenses	19.71
20	The Publishers and Printers' Engraving Co	Engraving, etc	8.84
	do	do	4.38
	The American Entomological Co	Insect boxes	55.00
29	Jno. C. Parker	Letter books	24.00
30	F. C. Pratt	Traveling expenses	32.15
31	E. A. Schwarz et al	Salaries	1,339.07
Sept. 7	Z. D. Gilman	Dishes, etc	5.92
	Jno. Ackhurst	Net rings and cones	5.50
	do	Forceps	3.00
	Bausch & Lomb Optical Co	Field glasses	30.40
	Library Bureau	Cards	25.60
13	L. O. Howard	Expenses	8.35
	Frank Benton	Traveling expenses	26.30
17	Jno. Green	Triplet	13.00
	The Publishers and Printers' Engraving Co	Engraving	14.84
	Queen & Co., incorporated	Cases and expressage	3.75
	Chas. P. Edmonston	Strainers, etc	1.30
19	C. B. Simpson	Salary	196.77

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

ENTOMOLOGICAL INVESTIGATIONS—Continued.

Date.	Name.	Nature of payment.	Total.
1900.			
Sept. 24	The Geo. W. Knox Express Co	Transportation	$14.05
	Southern Printers' Supply Co	Electros	.50
	Bausch & Lomb Optical Co	Burner, jars and labels	9.00
	The Publishers and Printers' Engraving Co	Engraving	2.19
29	E. A. Schwarz et al	Salaries	1,307.90
	Total first quarter		4,550.23
Oct. 2	C. B. Simpson	Traveling expenses	59.18
	American Press Clipping Bureau	Clippings	1.59
	Southern Printers' Supply Co	Electros	2.00
	L. O. Howard	Traveling expenses	24.00
5	Pennsylvania R. R. Co	Passenger transportation	74.25
15	Bernhard Hellmich	Photo on wood	1.75
16	American Press Clipping Bureau	Clippings	3.91
18	C. B. Simpson	Salary	100.00
24	Oregon Short Line R. R. Co	Passenger transportation	15.90
	The Oregon R. R. and Navigation Co	do	15.90
	D. Frank Parker	Mimeograph paper, etc	6.35
25	Southern Printers' Supply Co	Electros	5.00
26	L. O. Howard	Traveling expenses	8.80
30	E. Morrison Paper Co	Genn's covers	3.00
31	E. A. Schwarz et al	Salaries	1,367.24
Nov. 2	L. O. Howard	Expenses	6.95
	The Chesapeake and Potomac Telephone Co.	Telephone service	6.25
12	S. P. Tresslar	Photos	5.00
17	Mackall Bros	Glycerin	2.75
	Bausch & Lomb Optical Co	Labels	3.75
	C. B. Simpson	Salary	106.67
19	Houghton & Delano	Photo supplies	2.76
27	Z. D. Gilman	Droppers	.50
30	E. A. Schwarz et al	Salaries	1,328.80
Dec. 3	The Publishers and Printers' Engraving Co	Engraving	1.75
	Jno. Green	Triplet lens	13.00
	American Press Clipping Bureau	Clippings	2.25
	E. Morrison Paper Co	Cardboard	2.45
	do	Genn's covers	1.00
5	R. Carter Ballantyne	Envelopes	3.40
17	Sigrid Gustafson	Photos	6.00
18	Library Bureau	Book supports	7.50
20	The Publishers and Printers' Engraving Co	Engravings	1.00
29	American Press Clipping Co	Clippings	1.35
	The Maurice Joyce Engraving Co	Engraving	5.40
	J. Mantz Engraving Co	do	50.00
31	E. A. Schwarz et al	Salaries	1,371.60
	Total second quarter		4,619.00
1901.			
Jan. 3	The Publishers and Printers' Engraving Co	Engraving	13.48
	do	do	19.81
7	Mackall Bros	Cotton	2.75
	United States Express Co	Transportation	3.11
14	Rudolph, West & Co	Nippers	1.14
19	The Publishers and Printers' Engraving Co	Engraving	4.00
21	Bausch & Lomb Optical Co	Camera lucida, etc	21.10
24	Richd. L. Lamb	Numbering machine	9.80
	Harry J. Green	Thermometers	2.50
26	E. D. Foresman	Cocoons	7.50
	American Press Clipping Bureau	Clippings	1.65
28	J. Mantz Engraving Co	Engravings	50.00
31	E. A. Schwarz et al	Salaries	1,402.70
Feb. 1	S. T. Kemp	Cocoons	4.00
2	E. A. Schwarz	Traveling expenses	207.16
	Jno. Green	Repairing lens	10.00
5	The Publishers and Printers' Engraving Co	Drawings for line engravings	20.71
	do	Engraving	1.75
6	The Pullman Co	Passenger transportation	11.00
11	C. B. Simpson	Traveling expenses	92.90
	The Publishers and Printers' Engraving Co	Engraving	25.57
	do	do	13.12
12	E. H. Rust	Photos	5.00
	Library Bureau	Cards	2.25
	The Publishers and Printers' Engraving Co	Engravings	3.50
	The Chesapeake and Potomac Telephone Co.	Telephone rent	6.25
13	The Publishers and Printers' Engraving Co	Engravings	17.73
19	H. A. Morgan	Report	120.00

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

ENTOMOLOGICAL INVESTIGATIONS—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
Feb. 20	American Press Clipping Bureau	Clippings	$1.56
	Allen's Press Clipping Bureau	do	6.00
23	Houghton & Delano	Lantern slides	4.00
	The Publishers and Printers' Engraving Co	Engravings	1.75
	do	do	1.75
	do	do	5.25
26	The Maurice Joyce Engraving Co	do	1.25
	Southern Printers' Supply Co	Electro	.25
	do	do	13.55
27	Adams Express Co	Transportation	19.38
28	E. A. Schwarz et al	Salaries	1,289.78
Mar. 1	Peter Fireman	Translation	5.00
13	Woodward & Lothrop	Pins	5.50
14	E. J. Pullman	Slides	6.00
	Houghton & Delano	Photo supplies	9.60
15	W. D. Hunter	Salary	48.39
18	do	Traveling expenses	70.15
	Peter Henderson & Co	Mushroom spawn	.60
	Henry J. Green	Thermometers, etc	3.10
21	D. N. Walford	Knives	8.00
	B. F. T. Bell	Rings, etc	3.00
23	The Publishers and Printers' Engraving Co	Engravings	9.21
25	American Press Clipping Bureau	Clippings	1.50
	Mackall Bros	Alcohol	18.00
30	E. A. Schwarz et al	Salaries	1,443.20
	Total third quarter		5,056.25
Apr. 1	Northern Pacific Ry. Co	Passenger transportation	70.30
	Occidental and Oriental S. Ship Co	do	200.00
2	Church & Stevenson	Lumber	47.60
3	Bausch & Lomb Optical Co	Microscope, etc	64.85
6	Jno. C. Parker	Transfer cases	1.50
9	Southern Printers' Supply Co	Electros	.50
	Rudolph, West & Co	Locks, etc	1.47
10	Geo. C. Walker	Spray pump	15.00
	W. D. Hunter	Service	51.61
12	Henry A. Dreer, Inc	Seeds	.60
	Queen & Co., Inc	Insect pins	4.00
	The Publishers and Printers' Engraving Co	Engravings	14.00
16	Bausch & Lomb Optical Co	Slides, etc	7.61
	Whitall, Tatum & Co	Tubing and funnels	.56
	W. D. Hunter	Traveling expenses	76.70
17	American Press Clipping Bureau	Clippings	1.35
19	American Entomological Co	Nets, etc	11.00
20	Mackall Bros	Chloroform, etc	25.00
22	M. V. Slingerland	Lantern slides	78.00
	Houston and Texas Central R. R. Co	Passenger transportation	3.60
27	United States Express Co	Transportation	24.35
	Adams Express Co	do	22.99
29	A. L. Montandon	Specimens of insects	100.00
	The Publishers and Printers' Engraving Co	Engraving	3.90
30	E. A. Schwarz et al	Salaries	1,387.80
May 1	F. C. Pratt	Traveling expenses	24.45
3	The Chesapeake and Potomac Telephone Co.	Telephone rent	6.25
6	Allen's Press Clipping Bureau	Clippings	6.00
7	L. O. Howard	Traveling expenses	34.25
9	W. D. Hunter	Salary	98.90
17	Rudolph, West & Co	Knives, etc	2.10
	Church & Stephenson	Lumber	35.75
	do	do	7.09
20	The Publishers and Printers' Engraving Co.	Engravings	24.00
23	F. C. Pratt	Traveling expenses	18.65
24	W. D. Hunter	do	128.50
	J. Manz Engraving Co	Engravings	43.00
	do	do	49.00
	A. D. Hopkins	Report	300.00
	Library Bureau	Guides, etc	.50
27	Southern Rwy. Co	Passenger transportation	38.80
	Geo. F. Muth & Co	Atomizer	3.00
28	Western Union Telegraph Co	Service	3.84
	do	do	5.72
	do	do	1.21
	do	do	1.52
	do	do	.26
	do	do	.50
	The Maurice Joyce Engraving Co	Engraving plate	4.50
	Elphonzo Young	California buhach	

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

ENTOMOLOGICAL INVESTIGATIONS—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
May 31	E. A. Schwarz et al	Salaries	$1,392.40
June 3	American Press Clipping Bureau	Clippings	2.01
	Missouri, Kansas and Texas Rwy. Co	Passenger transportation	4.60
	Houston and Texas Central R. R. Co	do	7.90
	Pennsylvania R. R. Co	do	45.50
7	Walter D. Hunter	Services	100.00
11	do	Traveling expenses	87.91
	Gustav Eisen	Services	60.00
13	A. N. Candell	Traveling expenses	93.10
	Houghton & Delano	Photographic supplies	4.75
14	The Globe Wernicke Co	Indexes	4.00
18	Jas. B. Lambie	Hardware	1.02
21	American Press Clipping Bureau	Clippings	3.45
	The Publishers and Printers' Engraving Co.	Engraving	25.12
	do	do	1.75
	Western Union Telegraph Co	Services	2.75
24	E. Morrison Paper Co	Mailing tubes	1.00
25	Galveston, Harrisburg and San Antonio Rwy. Co	Passenger transportation	6.25
	New York, Texas and Mexican Rwy. Co	do	3.80
	San Antonio and Aransas Pass Rwy. Co	do	3.05
27	Mackall Bros	Carbon bisulphate, etc	4.90
29	E. A. Schwartz et al	Salaries	1,402.80
	Total fourth quarter		6,310.14
	Supplemental.		
July 2	Noyes Bros. & Cutler	Net, etc	7.55
5	Adams Express Co	Transportation	11.83
8	Walter D. Hunter	Salary	100.00
10	F. H. Chittenden	Traveling expenses	21.75
16	Ernest Betz	Making tank	37.00
17	Northrup, King & Co	Spray	6.00
	Church & Stephenson	Lumber	30.80
	Geo. F. Muth & Co	Gasoline, etc	2.77
	Rudolph, West & Co	Wire gauze, etc	30.00
	S. P. Johnson	Typewriter roller	1.75
	M. Du Perow	Fan	12.90
	A. N. Candall	Traveling expenses	91.80
18	Bausch & Lomb Optical Co	Scalpels, etc	10.73
19	Mackall Bros	Tin boxes, etc	28.50
	Houghton & Delano	Plates	5.29
	B. F. T. Bell	Circles, etc	6.24
	R. P. Clarke Co	Muslin	2.10
	Library Bureau	Book supports	19.50
	United States Express Co	Transportation	2.61
22	Rudolph, West & Co	Locks, etc	3.69
24	L. O. Howard	Expenses	2.33
25	C. B. Simpson	Salary	53.33
29	W. D. Hunter	Traveling expenses	105.75
Aug. 2	The Colorado and Southern R. R. Co	Passenger transportation	3.70
	San Antonio and Aransas Pass Rwy. Co	do	14.05
	Denver and Rio Grande R. R. Co	do	16.00
	John C. Parker	Cases	3.00
5	International and Great Northern R. R. Co	Passenger transportation	4.60
	The Texas Mexican Rwy. Co	do	3.25
21	The Chesapeake & Potomac Telephone Co	Service	6.25
24	C. B. Simpson	Traveling expenses	43.70
28	American Press Clipping Bureau	Clippings	6.09
Oct. 1	Jas. H. Thompson	Services	11.00
	Lehigh Valley R. R. Co	Passenger transportation	68.90
	Total		774.76

RECAPITULATION.

First quarter	$4,550.23
Second quarter	4,619.00
Third quarter	5,056.25
Fourth quarter	6,310.14
Supplemental	774.76
Total	21,310.38

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

VEGETABLE PATHOLOGICAL INVESTIGATIONS.

Date.	Name.	Nature of payment.	Total.
1900.			
July 13	W. C. Nichols	Labor and materials	$89.75
31	Erwin T. Smith et al	Salaries	1,613.00
Aug. 1	Jas. S. Topham	Extension case	6.50
	Chicago House Wrecking Co	Roofing	24.50
2	Hermann von Schrenk	Salary	50.00
	Geo. W. Hutchinson	Labor	4.50
3	Frank Dean	Services	40.00
	Houghton & Delano	Seed plates	4.98
10	do	Negative jackets	3.50
	Peter Henderson & Co	Glazing points	3.60
14	E. Morrison Paper Co	Sheets, etc	1.25
	do	Bags	4.35
	do	Boxes	1.80
	Mackall Bros	Acid	11.50
	F. W. Bolgiano	Blood	.50
	Rudolph, West & Co	Nails	.12
16	M. B. Waite	Traveling expenses	36.55
	do	do	19.85
	do	Expenses	5.10
18	Newton B. Pierce	Salary	168.50
20	Chicago House Wrecking Co	Steel roofing	5.25
21	United States Electric Lighting Co	Lights	4.14
	Washington Gaslight Co	Gas	1.60
23	D. B. Swingle	Office expenses	9.41
	do	Traveling expenses	6.30
	Chicago House Wrecking Co	Steel roofing	15.75
25	Church & Stephenson	Lumber	215.87
	Hugh Reilly	Glass	204.00
29	Newton B. Pierce	Traveling expenses	48.59
	do	Expenses	3.15
	Jas. Frawley	Manure	4.50
	E. P. Schmitz	Baskets	3.96
	Thos. Somerville & Son	Hardware	62.79
31	Erwin T. Smith et al	Salaries	1,449.39
Sept. 4	D. B. Swingle	Salary	19.35
5	Houghton & Delano	Seed plates	4.98
	do	Rubber tray	.85
	H. J. Webber	Expenses	25.05
	Jno. C. Moninger Co	Material	133.31
6	B. F. Galloway	Traveling expenses	9.50
	Frank Dean	Salary	40.00
7	Peter Henderson & Co	Bulbs	21.00
	Bausch & Lomb Optical Co	Lens, etc	28.17
	Whithall, Tatum & Co	Jars	9.12
8	H. J. Webber	Traveling expenses	55.62
12	United States Electric Lighting Co	Electric current	4.44
	Washington Gaslight Co	Gas	1.50
	Z. D. Gilman	Graduates	.76
13	Hermann von Schrenk	Salary	50.00
15	Houghton & Delano	Photographic paper	.30
17	The Durable Cement Post Co	Fence posts and freight	12.08
	E. A. Ormsby	Ventilation apparatus	110.00
	Jas. B. Lambie	Nails	15.82
	Arthur de Jaczewski	Specimens	5.70
	Jno. C. Parker	Pamphlet covers	28.00
	H. J. Webber	Traveling expenses	25.30
24	Library Bureau	Index cards	3.20
	Thos. Somerville & Sons	Spray pump	4.75
29	Erwin F. Smith et al	Salaries	1,498.11
	Total first quarter		6,231.46
Oct. 1	Mackall Bros	Ammonia water	2.81
2	M. A. Carleton	Salary	73.37
4	Frank Dean	do	40.00
5	Hermann von Schrenk	Traveling expenses	62.80
	Pennsylvania R. R. Co	Passenger transportation	17.00
	The Chesapeake and Ohio Rwy. Co	do	19.50
	Southern Rwy. Co	do	22.33
	The Wabash R. R. Co	do	10.50
	Denver and Rio Grande R. R. Co	do	18.00
	Atlantic Coast Line R. R. Co	do	8.59
	Norfolk and Washington Steamboat Co	do	8.75
8	W. A. Orton	Traveling expenses	83.31
	do	Expenses	13.27
9	Newton B. Pierce	Salary	331.50
	Hermann von Schrenk	do	50.00
10	do	Traveling expenses	72.75
12	Z. D. Gilman	Vials	3.00
	Mackall Bros	Chemicals	6.62

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

VEGETABLE PATHOLOGICAL INVESTIGATIONS—Continued.

Date.	Name.	Nature of payment.	Total.
1900.			
Oct. 16	Houghton & Delano	Plates and films	$5.52
	United States Electric Lighting Co	Electric current	4.00
	Washington Gaslight Co	Gas	2.40
	Rudolph, West & Co	Hardware	28.61
20	Thos. W. Smith	Siding, etc	33.38
23	M. B. Waite	Traveling expenses	99.39
	do	Expenses	9.80
24	Southern Rwy. Co	Passenger transportation	18.83
	do	do	8.51
	Chicago and Northwestern Rwy. Co	do	9.80
	Pennsylvania R. R. Co	do	48.00
	Illinois Central R. R. Co	do	10.06
	The Wabash R. R. Co	do	4.35
25	Houghton & Delano	Solio paper	6.90
26	Hermann von Schrenk	Expenses	15.25
30	Woodward & Lothrop	Sheeting	2.00
	Geo. F. Muth & Co	Lead and putty	19.60
31	Erwin F. Smith et al	Salaries	1,654.61
Nov. 1	Marine Biological Laboratory	Use of table	100.00
	Jennings Bros	Pipe fittings	80.36
2	Chas. Dean	Labor	5.00
	Eimer & Amend	Erythrosin	.51
	R. P. Clarke Co	Toweling	6.25
	J. Baumgarten & Sons	Rubber type	3.40
	The Chesapeake and Potomac Telephone Co	Telephone service	6.25
3	Frank Dean	Salary	40.00
5	Houghton & Delano	Chloride gold	.82
6	Northern Pacific Rwy. Co	Passenger transportation	4.55
12	G. L. Taber	Orange trees	24.60
17	Library Bureau	Index cards	2.45
	Bausch & Lomb Optical Co	Photographic supplies	6.10
	Church & Stephenson	Lumber	235.55
	do	do	18.43
19	Houghton & Delano	Photographic supplies	9.28
20	Mackall Bros	Acids, etc	18.13
	Arthur de Jaczewski	Specimens	4.92
21	Church & Stephenson	Lumber	27.54
26	E. C. Rittne	Traveling expenses	7.45
27	United States Electric Lighting Co	Electric current	5.64
	Thos. Somerville & Sons	Repairing table	7.04
	Washington Gaslight Co	Gas	2.20
	Hugh Reilly	Glass	44.00
	Rudolph, West & Co	Screws and lock	2.63
30	Erwin F. Smith et al	Salaries	1,543.20
Dec. 3	J. W. Killen	Planting sweet potatoes	30.00
	A. Corell	Hauling	1.50
	Eimer & Amend	Plate holder, etc	12.32
	A. C. McClurg & Co	Ledgers	1.80
	J. Manz Engraving Co	Engravings	30.00
	Houghton & Delano	Paper, etc	1.75
	E. Morrison Paper Co	Bags	.92
5	Forsberg & Murray	Grate bars, etc	42.25
	Northern Pacific Rwy. Co	Passenger transportation	24.35
	Pennsylvania Co	do	17.50
	Atlantic Coast Line R. R. Co	do	23.23
	Thos. Somerville & Sons	do	224.84
6	Frank Dean	Salary	40.00
14	Newton B. Pierce	do	168.50
	do	Traveling expenses	3.65
	Herman von Schrenk	Salary	100.00
	The Friedenwald Co	Tissue	12.00
	P. J. Kipp & Zouen	Microtome, etc	140.43
	Jno. C. Parker	Tags	4.35
17	Louis Hopfenmaier	Radiator	12.00
19	M. A. Carleton	Expenses	31.54
21	United States Electric Lighting Co	Electric lights	3.54
	Washington Gaslight Co	Gas	1.70
	H. L. Galloway	Rent and care of land	14.60
26	H. J. Webber	Traveling expenses	79.65
29	Jas. B. Lambie	Sash cord	1.66
	do	Nails	3.20
31	E. F. Smith et al	Salaries	1,593.40
	Total, second quarter		7,652.09
1901.			
Jan. 2	Pennsylvania R. R. Co	Passenger transportation	6.00
3	Whitall, Tatum & Co	Jars	2.68
5	Frank Dean	Salary	40.00
7	Church & Stevenson	Lumber	4.80

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

VEGETABLE PATHOLOGICAL INVESTIGATIONS—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
Jan. 7	United States Express Co	Transportation	$2.05
14	Rudolph, West & Co	Screws, etc	1.10
	Mackall Bros	Chemicals	1.27
	Z. D. Gilman	Glass bottles	7.00
	Chas. Becker	Oil	18.00
16	N. B. Pierce	Expenses	146.70
	United States Electric Lighting Co	Electric current	3.78
	Washington Gaslight Co	Gas	1.50
	Thos. Somerville & Sons	Fittings, pipe, etc	94.41
18	Frank Dean	Salary	19.35
	The Maurice Joyce Engraving Co	Engraving	6.00
21	Whitall, Tatum & Co	Flasks	.77
	Bausch & Lomb Optical Co	Cylinder	.66
22	Washington Gaslight Co	Gas connections	25.00
	Thos. Somerville & Sons	Pipe, etc	24.54
	do	Fittings	.91
23	Erwin F. Smith	Traveling expenses	28.60
29	Mackall Bros	Sulphuric acid	2.40
30	Newton B. Pierce	Salary	163.00
	do	do	168.50
31	Erwin F. Smith et al	Salaries	1,598.82
Feb. 1	P. F. Van Everen	Library numbers	1.50
2	Houghton & Delano	Photographic supplies	9.81
	do	Solio paper	7.40
5	Herman von Schrenk	Salary	100.00
6	Seaboard Air Line Rwy. Co	Passenger transportation	22.65
	Charleston and Savannah Rwy. Co	do	8.60
	New York Central and Hudson River R.R. Co.	do	9.47
	Michigan Central R. R. Co	do	2.40
	Pennsylvania Co	do	13.50
	Southern Rwy. Co	do	19.91
	do	do	3.89
	Pennsylvania R. R. Co	do	8.70
7	H. C. Henrickson	Salary	20.65
11	E. L. Brady & Co	Fertilizer	19.60
	Thos. W. Smith	Lumber	13.76
	do	do	197.85
12	Bausch and Lomb Optical Co	Covers	3.04
	E. Morrison Paper Co	Herbarium paper	13.50
	The Chesapeake and Potomac Telephone Co	Telephone rent	6.25
20	Newton B. Pierce	Traveling expenses	4.85
	do	Expenses	44.10
	do	do	44.34
	do	Traveling expenses	18.45
	Newton B. Pierce	Salary	172.20
21	Stephenson's Express	Transportation	1.94
23	Houghton & Delano	Chloride gold	2.46
	do	Plates	1.20
	do	Toning solution	1.00
	do	Plates	.94
	do	Solio paper	12.05
26	Geo. F. Muth & Co	Turpentine	1.06
	Thos. Somerville & Sons	Laboratory fittings	4.70
	Blue Line Transfer Co	Transportation	8.27
	E. Morrison Paper Co	Copy paper	4.00
	United States Electric Lighting Co	Electric current	2.86
	Washington Gaslight Co	Gas	1.70
27	Chicago, Rock Island and Pacific Rwy. Co	Passenger transportation	6.60
	Adams Express Co	Transportation	13.36
28	Erwin F. Smith et al	Salaries	1,451.86
Mar. 5	H. C. Henrickson	Salary	40.00
15	J. Manz Engraving Co	Engraving	7.50
16	H. J. Webber	Expenses	4.50
18	E. Fireman	Translating	10.00
19	Mackall Bros	Chemicals	5.92
21	W. M. Whyte	Zinc labels	9.00
25	Mackall Bros	Carbon, etc	7.50
	Washington Gaslight Co	Gas	1.70
	The Chesapeake and Potomac Telephone Co.	Moving telephone	2.75
	United States Electric Lighting Co	Electric current	3.61
	H. J. Webber	Expenses	2.25
30	Erwin F. Smith et al	Salaries	1,302.49
	Total, third quarter		6,045.48
Apr. 1	Jno. C. Parker	Dictionary stand	4.50
	Grand Rapids and Indiana Rwy. Co	Passenger transportation	16.60

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

VEGETABLE PATHOLOGICAL INVESTIGATIONS—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
Apr. 4	Herman von Schrenk	Salary	$100.00
	H. C. Henricksen	do	40.00
9	M. B. Waite	Traveling expenses	4.30
12	Library Bureau	Index cards	3.20
16	N. B. Pierce	Salary	172.20
	do	do	155.60
	Z. D. Gilman	Cotton	1.20
	Thos. Somerville & Sons	Brackets, etc	6.05
	Mackall Bros	Photos chloride	2.50
20	United States Electric Lighting Co	Electric current	4.21
	Washington Gaslight Co	Gas	1.20
	Houghton & Delano	Photographic supplies	13.08
	J. E. Lumnus	Soap, etc	1.55
27	N. B. Pierce	Traveling expenses	23.60
	do	Expenses	163.60
	United States Express Co	Transportation	14.01
	American Express Co	do	18.67
30	E. F. Smith et al	Salaries	1,263.11
May 3	The Chesapeake and Potomac Telephone Co	Telephone rent	6.25
	do	do	4.10
	H. C. Henrickson	Salary	40.00
4	W. A. Orton	Expenses	73.13
	do	Traveling expenses	46.48
6	Herman von Schrenk	Expenses	12.05
9	Frank T. Budge	Plow, etc	9.21
16	United States Electric Lighting Co	Electric current	4.54
	Mackall Bros	Soda	2.85
	E. Morrison Paper Co	Paper	8.00
	Houghton & Delano	Photographic supplies	50.19
17	Thos. Somerville & Sons	Apparatus	10.30
24	Newton B. Pierce	Salary	164.80
	H. A. McComb	Labor	10.80
27	Pennsylvania R. R. Co	Passenger transportation	15.85
	Church & Stephenson	Lumber	7.28
	do	do	8.00
28	Mackall Bros	Acid, etc	19.47
29	M. B. Waite	Traveling expenses	11.45
	M. A. Carleton	do	17.59
31	E. F. Smith et al	Salaries	1,359.94
June 4	Washington Gaslight Co	Gas	2.30
	do	do	1.20
	do	do	1.00
5	H. C. Henrickson	Salary	40.00
	H. von Schrenk	do	100.00
11	do	Expenses	7.75
	do	do	16.40
	Z. D. Gilman	Blue pencils	1.98
14	H. von Schrenk	Traveling expenses	34.60
	J. B. Ellis	Book	5.00
	Carl Zeiss	Postage on objectives	.43
	M. B. Waite	Traveling expenses	7.80
15	E. Morrison Paper Co	Paste and ink	1.25
18	Whitall, Tatum & Co	Vials and jars	5.67
	M. A. Carleton	Traveling expenses	29.65
25	Grand Trunk Rwy. Co	Passenger transportation	4.23
	Southern Rwy. Co	do	26.00
	do	do	5.20
	Houghton & Delano	Seed plates	4.22
27	United States Electric Lighting Co	Electric current	4.57
	Washington Gaslight Co	Gas	2.20
	do	do	.10
	Mackall Bros	Chemicals, etc	10.07
	Newton B. Pierce	Salary	170.40
29	Erwin F. Smith et al	Salaries	1,347.51
	Total, fourth quarter		5,720.39
	Supplemental.		
July 1	H. von Schrenk	Salary	50.00
2	E. J. Pullman	Photographic paper	1.50
5	Adams Express Co	Transportation	12.22
9	Library Bureau	Cards	2.90
11	H. C. Henrickson	Salary	40.00
13	J. W. Watson	Tools	6.10
	Chase & Harney	Tobacco dust	5.13
16	G. G. Hedgcock	Traveling expenses	11.51
17	J. C. Arthur	Specimens	3.10
	N. B. Pierce	Salary	164.80
18	Bausch & Lomb Optical Co	Triplet	3.07

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

VEGETABLE PATHOLOGICAL INVESTIGATIONS—Continued.

Date.	Name.	Nature of payment.	Total.
	Supplemental—Continued.		
1901.			
July 19	H. von Schrenk	Expenses	$36.05
	Houghton & Delano	Photographic supplies	9.35
	United States Electric Lighting Co	Electric current	3.68
	Washington Gasilght Co	Gas	1.70
20	E. Morrison Paper Co	Bags	12.08
	J. W. Vestal	Sweet potato plants	2.50
22	E. J. Pullman	Photo supplies	7.00
	do	do	42.15
	Stark Bros. Nurseries and Orchard Co	Grafting, etc	24.00
24	Woodward & Lothrop	Boiler	3.85
25	N. B. Pierce	Traveling expenses	27.25
	do	Expenses	172.50
	F. W. Faurot	Traveling expenses	27.80
29	C. P. Hartley	do	53.90
	do	Expenses	3.60
30	J. C. Parker	Pamphlet cases	10.50
Aug. 2	R. W. Pow	Expressage	1.50
	R. C. Ballantyne	Tags	9.86
	Southern Rwy. Co	Passenger transportation	10.40
	do	do	10.40
	do	do	10.40
	do	do	5.20
	do	do	10.60
	do	do	10.05
6	Sheetz & Bishop	Camera, etc	66.20
10	C. R. Edmonston	Stew pans	.51
	W. B. Moses & Sons	Coolers	4.25
21	The Chesapeake and Potomac Telephone Co.	Services	12.50
	do	do	1.00
Sept. 21	F. W. Faurot	Expenses	5.50
	W. A. Orton	do	49.56
Oct. 4	Cincinnati and Muskingum Valley R. R. Co.	Passenger transportation	1.45
	The Lake Shore and Michigan Southern Rwy. Co.	do	17.50
	The Pittsburg, Cincinnati, Chicago and St. Louis Rwy. Co.	do	2.80
5	Southern Rwy. Co	do	5.20
	The Chesapeake and Ohio Rwy. Co	do	14.00
	Baltimore and Ohio Rwy. Co	do	12.75
	Total		997.87

RECAPITULATION.

First quarter	$6,231.46
Second quarter	7,652.09
Third quarter	6,045.48
Fourth quarter	5,720.39
Supplemental	997.87
Total	26,647.29

RENT OF BUILDING.

Date.	Name.	Nature of payment.	Total.
1900.			
Aug. 14	Jno. F. Shea	Rent	$55.00
Sept. 5	do	do	55.00
	Total first quarter		110.00
Oct. 20	Jno. F. Shea	Rent	55.00
Nov. 13	do	do	55.00
Dec. 6	do	do	55.00
	Total second quarter		165.00
1901.			
Jan. 7	Jno. F. Shea	Rent	55.00
Feb. 2	do	do	55.00
Mar. 2	do	do	55.00
	Total third quarter		165.00

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

RENT OF BUILDING—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
Apr. 3	Jno. F. Shea	Rent	$55.00
May 2	do	do	55.00
June 11	do	do	55.00
	Total fourth quarter		165.00
	Supplemental.		
July 17	Jno. F. Shea	Rent	55.00
	Total		660.00

BIOLOGICAL INVESTIGATIONS.

1900.			
July 10	Sheetz & Bishop	Photo supplies	$47.89
17	Wm. Wagner	Shells, etc	11.64
19	Sheetz & Bishop	Kodak, etc	22.00
24	W. P. Melville	Birds' stomachs	7.10
	W. W. Worthington	do	5.00
31	E. A. Goldman	Salary	117.90
	E. W. Nelson	do	151.60
	W. H. Osgood et al	Salaries	471.70
Aug. 1	F. P. May & Co	Iron cans	1.50
	Vernon Bailey	Salary	168.50
7	W. H. Osgood	Traveling expenses	120.80
8	E. C. Gill, jr	Birds' stomachs	6.00
10	W. W. Worthington	do	8.39
	A. H. Verrill	Photos, birds and mammals	2.50
	Houghton & Delano	Solio paper	10.30
	do	Cramer crown plates	7.08
11	W. K. Fisher	Salary	100.00
	Whitall, Tatum & Co	Shell vials and corks	22.09
	E. R. Warren	Photos, birds and mammals	4.50
	H. E. Wilder	Birds' stomachs	1.43
14	Sheetz & Bishop	Developing plates	10.20
	Houghton & Delano	Crown plates, etc	5.40
	Mackall Bros	Cotton batting	7.95
	Z. D. Gilman	Scissors, etc	7.30
16	Vernon Bailey	Traveling expenses	60.00
20	Hudson Bay Co	Passenger transportation, etc	300.00
23	Allen Brooks	Mammals and birds	17.60
24	Jno. C. Parker	Record books	7.20
	Harry C. Oberholser	Traveling expenses	57.03
25	Andrew B. Graham	Photolithographing	37.50
	Harry C. Oberholser	Traveling expenses	134.97
	F. P. May & Co	Mouse traps	63.60
31	W. H. Osgood et al	Salaries	387.50
Sept. 1	E. A. Goldman	Salary	117.90
4	Vernon Bailey	do	168.50
	E. W. Nelson	do	151.60
	W. K. Fisher	do	100.00
5	Houghton & Delano	Photo supplies	7.10
	C. D. Gilbert	Birds' stomachs	1.50
7	W. W. Worthington	do	2.00
12	F. P. May & Co	Steel traps	15.00
17	Jas. B. Lambie	Excelsior, etc	1.93
18	The Hudson Bay Co	Passenger transportation, etc	300.00
19	Ralph G. Johnson	Mammals	6.90
	Sheetz & Bishop	Developing plates	1.80
29	W. H. Osgood et al	Salaries	375.00
	Total first quarter		3,633.40
Oct. 1	Walter K. Fisher	Salary	100.00
	E. A. Goldman	do	114.20
	Vernon Bailey	do	163.00
	E. W. Nelson	do	146.80
2	J. Manz Engraving Co	Views	27.00
4	The Publishers and Printers Engraving Co.	Engraving	29.03
5	The Atchison, Topeka and Santa Fe Rwy. Co.	Passenger transportation	23.35
8	C. Hart Merriam	Traveling expenses	390.25
	do	Expenses	32.33
10	Walter K. Fisher	Traveling expenses	33.15
12	Vernon Bailey	do	90.00
	Z. D. Gilman	Corks	7.50

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

BIOLOGICAL INVESTIGATIONS—Continued.

Date.	Name.	Nature of payment.	Total.
1900.			
Oct. 12	Mackall Bros	Arsenic	$3.25
	Sheetz & Bishop	Negative albums	4.00
16	The Hudson Bay Co	Supplies and subsistence furnished.	451.79
23	Edward A. Preble	Traveling expenses	31.80
	do	do	2.75
	do	Expenses	46.15
	do	do	40.00
	do	do	45.00
	Allan Brooks	Mammals	24.50
24	Ft. Worth and Denver City Rwy. Co	Passenger transportation	38.15
	Santa Fe Pacific R. R. Co	do	51.50
26	W. H. Osgood	Traveling expenses	80.90
	do	do	85.50
31	W. H. Osgood et al	Salaries	387.50
Nov. 1	E. W. Nelson	Salary	151.60
	E. A. Goldman	do	117.90
	Vernon Bailey	do	168.50
	The Folmer & Schwing Manufacturing Co.	Photo supplies	21.04
2	The Chesapeake and Potomac Telephone Co.	Telephone service	6.25
3	Harry Hoskinson	Films	10.50
12	W. E. Snyder	Birds' stomachs	18.30
15	J. K. Hillers	Photo plates	8.74
17	Sheetz & Bishop	Negative albums	5.50
19	Houghton & Delano	Photo supplies	12.05
23	Walter K. Fisher	Photos	38.00
28	C. Hart Merriam	Traveling expenses	33.50
	T. S. Palmer	do	9.60
	do	do	23.45
30	W. H. Osgood et al	Salaries	375.00
Dec. 1	E. W. Nelson	Salary	146.80
	Vernon Bailey	do	163.00
	E. A. Goldman	do	114.20
3	Outram Bangs	Mammals	25.10
5	Pittsburg, Cincinnati, Chicago and St. Louis Rwy. Co.	Passenger transportation	16.00
	Baltimore and Ohio R. R. Co	do	17.50
	Great Northern Rwy. Co	do	77.10
7	W. H. Osgood	Traveling expenses	149.60
10	do	do	49.55
	A. K. Fisher	do	24.75
11	The Maurice Joyce Engraving Co	Engraving	22.14
14	W. E. Snyder	Birds' stomachs	2.00
	F. W. Nelson	Mammals	57.50
17	Mackall Bros	Potassium nitrate	3.00
	Z. D. Gilman	Rubber stoppers	.97
26	F. P. May & Co	Rat traps	6.00
31	Alfred R. Dotin et al	Salaries	387.50
	Total second quarter		4,712.04
1901.			
Jan. 2	E. W. Nelson	Salary	151.60
	Vernon Bailey	do	168.50
	Alaska Commercial Co	Transportation	9.75
3	E. A. Goldman	Salary	117.90
5	A. G. Maddren	Skulls	9.00
	Byron Stowell	do	2.50
7	United States Express Co	Transportation	21.65
14	Houghton & Delano	Photo supplies	17.70
	E. Morrison Paper Co	Ink	1.00
16	T. S. Palmer	Traveling expenses	10.10
19	Sheetz & Bishop	Photo supplies	68.80
	E. C. Gill, jr	Birds' stomachs	4.95
	E. Morrison Paper Co	Strawboard	4.62
22	N. R. Streeter & Co	Mouse trap	8.00
24	J. M. Hayes	Mammal	10.00
	Mackall Bros	Alum, etc	6.44
29	Otto Holstein	Birds' stomachs	1.85
30	A. R. Doten et al	Salaries	396.00
31	E. A. Goldman	Salary	120.60
Feb. 1	E. W. Nelson	do	155.00
	Vernon Bailey	do	172.20
	Witmer Stone	Mammals	20.25
5	C. J. Crandall & Co	Photos	6.15
	P. B. Peabody	Negatives	7.00
	Union Pacific R. R. Co	Passenger transportation	30.25
6	Northern Pacific Rwy. Co	do	5.20
	Baltimore and Ohio R. R. Co	do	10.00

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

BIOLOGICAL INVESTIGATIONS—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
Feb. 11	Witmer Stone	Mammals	$43.75
12	Rochester Optical and Camera Co	Repairs to camera	2.00
	Dill & Collins	Paper	100.80
	The Chesapeake and Potomac Telephone Co.	Telephone rent	6.25
19	Albert T. Ganier	Birds' stomachs	2.60
	Chas. M. Barber	Mammals	2.00
20	T. S. Palmer	Traveling expenses	15.00
23	Houghton & Delano	Photo supplies	6.83
	Thora Steineger	Salary	40.76
26	The Maurice Joyce Engraving Co	Engraving	2.00
	Rudolph, West & Co	Paste brushes	2.10
27	Adams Express Co	Transportation	31.13
28	Vernon Bailey	Salary	155.60
	The Publishers and Printers' Engraving Co.	Engravings	11.17
	A. R. Doten et al	Salaries	380.22
Mar. 1	Houghton & Delano	Films	19.20
	T. S. Palmer	Traveling expenses	8.17
	E. W. Nelson	Salary	140.00
	E. A. Goldman	do	108.80
2	The Folmer & Schwing Manufacturing Co.	Plate holder	13.50
12	Jno. Cairnes	Mammals	4.00
13	Fred A. Schmidt	Steel tapes	9.60
14	Rudolph, West & Co	Card holder	3.25
	The Geo. W. Knox Express Co	Transportation	3.36
15	J. Manz Engraving Co	Engraving	5.00
18	Peter Schmid	Mammals	9.00
	W. E. Snyder	Birds' stomachs	2.35
	do	do	4.45
	H. H. Dunn	do	1.50
	E. R. Warren	Photos	5.10
20	T. S. Palmer	Traveling expenses	4.70
21	J. K. Hillers	Developing plates	10.26
	H. H. Dunn	Birds' stomachs	3.20
23	Whitall, Tatum & Co	Vials, etc	9.13
27	Walter K. Fisher	Mammals	25.00
	Beasley & Parr	do	4.00
29	W. E. Clyde Todd	Birds' stomachs	6.85
30	A. R. Doten et al	Salaries	499.30
	Total third quarter		3,238.94
Apr. 1	E. A. Goldman	Salary	120.60
	E. W. Nelson	do	155.00
	Vernon Bailey	do	172.20
	Pennsylvania R. R. Co	Passenger transportation	10.00
	Southern Pacific Co	do	3.25
	do	do	5.55
3	H. H. Dunn	Birds' stomachs	3.20
10	H. C. Oberholser	Traveling expenses	29.60
	The J. C. Ergood Co	Soapine	2.87
	Rudolph, West & Co	Wire	1.06
	Z. D. Gilman	Court-plaster	.50
	Jno. C. Parker	File book	1.25
12	Louis Fuertes	Drawings of birds	120.00
	The Publishers and Printers' Engraving Co.	Engraving	12.00
	Peter Schmid	Mammals	8.00
	E. P. Alexander	Birds' stomachs	2.43
	Jas. Dawson	Mammals	6.50
16	J. Manz Engraving Co	Engravings	20.00
	Mackall Bros	Arsenic	3.25
17	Alex. Gow	Birds' stomachs	1.50
19	G. F. Dippie	Skins and skulls	29.00
	W. W. Worthington	Birds' stomachs	4.45
20	Houghton & Delano	Plates and paper	5.14
	F. P. May & Co	Traps	18.00
24	H. H. Dunn	Birds' stomachs	3.00
	Wyckoff, Seamans & Benedict	Letter paper	10.08
	Sheetz & Bishop	Films	46.80
	Colburn Lockwood Co	Tanning mammals	16.50
27	United States Express Co	Transportation	32.15
	Adams Express Co	do	14.49
29	F. A. Lockhart	Photos	30.00
	Peter Schmid	Mammals	3.00
	Will. C. Colt	Birds' stomachs	1.50
30	Vernon Bailey	Salary	164.80
	A. R. Doten et al	Salaries	503.10
May 1	W. Wagner	Shells, etc	28.66

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

BIOLOGICAL INVESTIGATIONS—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
May 1	Jas. S. Topham	Leather handles	$0.75
	E. A. Goldman	Salary	115.40
	E. W. Nelson	do	148.30
3	The Chesapeake and Potomac Telephone Co.	Telephone rent	6.25
6	Jas. B. Monroe	Mammals	3.00
	Jas. Dawson	do	3.00
	W. J. Yeager	do	1.50
8	Western Union Telegraph Co	Telegraph service	5.48
	do	do	2.40
16	Houghton & Delano	Photo supplies	17.71
	Z. D. Gilman	Flax tow, etc	12.21
17	Rudolph, West & Co	Wire, etc	1.85
20	H. C. Oberholser	Traveling expenses	172.75
24	A. L. Bolton	Mammals	5.00
	E. R. Warren	Photo prints	.90
	Bausch & Lomb Optical Co	Slides	1.50
27	The Chesapeake and Ohio Rwy. Co	Passenger transportation	44.50
	Sheetz & Bishop	Albums, etc	15.45
	Wm. Wagner	Cartridges	5.00
28	Western Union Telegraph Co	Service	5.11
	do	do	3.69
	do	do	2.70
	do	do	1.28
	Sylvester D. Judd	Traveling expenses	10.50
31	A. R. Doten et al	Salaries	518.80
June 1	Vernon Bailey	Salary	170.40
3	Defender Photo Supply Co	Photo paper	2.40
	W. E. Snyder	Birds' stomachs	8.95
	Mackey & Dippie	Mammal specimens	24.85
	E. A. Goldman	Salary	119.20
	E. W. Nelson	do	153.40
5	H. C. Oberholser	Traveling expenses	60.20
	H. H. Dunn	Birds' stomachs	3.00
11	F. P. May & Co	Mouse traps	46.50
	Z. D. Gilman	Needles, etc	.75
13	Houghton & Delano	Photographic supplies	10.33
	Rudolph, West & Co	Wire	8.71
14	W. W. Worthington	Birds' stomachs	6.55
15	Doremus Manufacturing Co	Steelyard	10.00
21	F. E. L. Beal	Traveling expenses	43.55
	Western Union Telegraph Co	Service	8.69
	S. H. Lyman	Birds' stomachs	5.00
28	Wyckoff, Seamans & Benedict	Repairs to typewriter	.90
29	A. R. Doten et al	Salaries	503.10
	Total fourth quarter		3,880.94
	Supplemental.		
July 1	E. A. Goldman	Salary	115.40
	E. W. Nelson	do	148.30
	Vernon Bailey	do	164.80
	do	Traveling expenses	79.50
5	W. E. Snyder	Birds' stomachs	7.50
	Adams Express Co	Transportation	27.42
8	A. H. Verrill	Photos	4.75
9	F. E. L. Beal	Traveling expenses	54.98
12	Vernon Bailey	do	100.50
17	Houghton & Delano	Plates	2.12
	H. C. Oberholzer	Traveling expenses	52.50
19	United States Express Co	Transportation	34.52
29	Z. D. Gilman	Scissors	1.10
	Howard Lacy	Mammals	13.50
Aug. 2	Thos. H. Hambright	do	6.10
	Jno. C. Parker	Cases, etc	10.15
	E. Morrison Paper Co	Scrapbooks	4.00
	Galveston, Harrisburg and San Antonio Rwy. Co.	Passenger transportation	8.90
12	The Geo. W. Knox Express Co	Transportation	9.31
21	The Chesapeake and Potomac Telephone Co.	Service	6.25
29	The American Distributing Co	Alcohol	24.95
Oct. 5	Florida East Coast R. R. Co	Passenger transportation	20.60
12	Postal Telegraph Cable Co	Service	2.84
	Total		899.99

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

RECAPITULATION.

First quarter	$3,633.40
Second quarter	4,712.04
Third quarter	3,238.94
Fourth quarter	3,880.94
Supplemetal	899.99
Total	16,365.31

POMOLOGICAL INVESTIGATIONS.

Date.	Name.	Nature of payment.	Total.
1900.			
July 31	W. P. Corsa et al	Salaries	$670.69
Aug. 14	E. J. Pullman	Chemical supplies	1.62
17	Wm. A. Taylor	Traveling expenses	35.00
29	do	do	33.80
31	W. P. Corsa et al	Salaries	823.40
Sept. 5	Houghton & Delano	Plates	3.51
	do	Developer	1.00
24	Rochester Optical and Camera Co	Repairs to camera	.95
29	W. P. Corsa et al	Salaries	803.20
	Total first quarter		2,373.17
Oct. 25	Houghton & Delano	Plates	2.34
30	Geo. F. Muth & Co	Wax, wire, etc	2.75
	Richard L. Lamb	Stamp rack	.65
31	W. P. Corsa et al	Salaries	771.79
Nov. 26	E. Morrison Paper Co	Herbarium paper	9.00
	Houghton & Delano	Seed plates, etc	2.56
30	W. P. Corsa et al	Salaries	703.20
Dec. 5	Pennsylvania R. R. Co	Passenger transportation	6.50
8	Wm. A. Tabor	Traveling expenses	51.18
17	Mackall Bros	Hyposulp. soda	.40
18	Library Bureau	Cards	12.20
31	Wm. P. Corsa et al	Salaries	723.40
	Total second quarter		2,285.97
1901.			
Jan. 31	W. P. Corsa et al	Salaries	732.20
Feb. 2	Houghton & Delano	Plates, etc	2.88
5	Cheshire Manufacturing Co	Tree labels	6.38
6	The Chicago, Burlington and Quincy R. R. Co.	Passenger transportation	7.25
	Lehigh Valley R. R. Co	do	7.00
	Hannibal and St. Joseph R. R. Co	do	6.60
	New York Central and Hudson River R. R. Co.	do	.97
	Michigan Central R. R. Co	do	11.82
	The Missouri Pacific Rwy. Co.	do	27.75
12	Library Bureau	Cards	12.50
13	Whitall, Tatum & Co	Jars	10.92
18	S. P. Johnson	Cylinder	1.52
23	Houghton & Delano	Solio prints	2.08
26	Geo. F. Muth & Co	Plaster	2.75
	E. Morrison Paper Co	Cards	2.40
27	Adams Express Co	Transportation	11.62
28	W. P. Corsa et al	Salaries	645.20
Mar. 18	The Publishers and Printers Engraving Co.	Illustrations	38.39
30	W. P. Corsa et al	Salaries	664.90
	Total third quarter		2,200.11
Apr. 1	Jno. C. Parker	Wax paper	4.50
4	W. P. Corsa	Traveling expenses	5.00
22	Pennsylvania R. R. Co	Passenger transportation	9.70
27	United States Express Co	Transportation	5.62
	Adams Express Co	do	13.32
30	W. P. Corsa et al	Salaries	640.60
May 3	The Chesapeake and Potomac Telephone Co.	Telephone rent	6.25
31	W. P. Corsa et al	Salaries	658.80
June 12	do	Traveling expenses	12.87
25	Pennsylvania R. R. Co	Passenger transportation	4.85
29	W. P. Corsa	Salaries	640.60
	Total fourth quarter		2,002.11

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

POMOLOGICAL INVESTIGATIONS—Continued.

Date.	Name.	Nature of payment.	Total.
	Supplemental.		
1901.			
July 9	Alex. Schmid	Boxes	$29.00
16	W. A. Taylor	Expenses	2.25
	Geo. C. Husman	Traveling expenses	23.50
19	Library Bureau	Index cards	40.00
Aug. 2	Pennsylvania R. R. Co	Passenger transportation	15.35
12	H. von Lutticham	Expenses	116.95
21	The Chesapeake and Potomac Telephone Co.	Services	6.25
Oct. 4	Seaboard Air Line Rwy. Co	Passenger transportation	15.85
	do	do	24.90
	Total		274.05

RECAPITULATION.

First quarter	$2,373.17
Second quarter	2,285.97
Third quarter	2,200.11
Fourth quarter	2,002.11
Supplemental	274.05
Total	9,155.41

LABORATORY.

Date.	Name.	Nature of payment.	Total.
1900.			
July 31	E. G. Runyon et al	Salaries	$572.80
Aug. 31	D. V. Groesbeck et al	do	146.98
	E. G. Runyon et al	do	572.80
Sept. 5	Frederick Carl	Repairing spectroscope	2.00
7	J. G. Taylor & Sons	Refrigerator	45.00
	Eimer & Amend	Tube	7.50
12	United States Electric Lighting Co	Electric current	15.12
	Washington Gas Light Co	Gas	.40
29	A. W. Bache et al	Salaries	130.25
	E. G. Runyon et al	do	554.40
	Total first quarter		2,047.25
Oct. 2	M. DuPerow	Fan	10.50
	Woodruff Manufacturing Co	Parts of record case	88.52
10	John T. Springmann, jr., & Bro	Grate bars	3.72
16	Washington Gas Light Co	Gas	4.00
30	M. Silverberg & Co	Gilt molding	.75
	E. Morrison Paper Co	Labels	.25
	United States Electric Lighting Co	Electric current	9.48
	E. Morrison Paper Co	Index cards	10.20
31	Lillie Ryon et al	Salaries	143.68
	E. G. Runyan et al	do	575.80
Nov. 2	R. P. Clarke Co	Toweling	10.28
	Geo. F. Muth & Co	Lanterns, etc	2.02
3	The Chesapeake and Potomac Telephone Co.	Telephone service	6.25
14	The Witt Cornice Co	Cans	6.00
17	Mackall Bros	Chemicals	138.64
	M. DuPerow	Electric supplies	6.35
20	M. Schuster	Repairs	.35
	R. P. Clarke Co	Sheeting	2.00
22	Williams, Brown & Earle	Magnifier	.73
23	E. Morrison Paper Co	Cardboard	1.86
	Houghton & Delano	Photo supplies	.90
27	Z. D. Gilman	Potash, etc	21.45
	The Geo. W. Knox Express Co	Transportation	.28
	United States Electric Lighting Co	Electric current	9.87
	Barber & Ross	Tank	19.50
27	National Electric Supply Co	Button plate	2.30
	Thos. Somerville & Sons	Repairs to press	1.30
	S. Kann Sons & Co	Cotton	.25
	Washington Gas Light Co	Gas	9.90
	Rudolph, West & Co	Tin tapeline, etc	9.87
30	Emil Schlichting et al	Salaries	148.00
	E. G. Runyan et al	do	446.20
Dec. 3	Library Bureau	Cards	38.98
	Emil Grenier	Silk handkerchief, etc	13.50

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

LABORATORY—Continued.

Date.	Name.	Nature of payment.	Total.
1900.			
Dec. 3	The Burnet Co	Batteries	$3.90
	Church & Stephenson	Lumber	8.41
11	Forsburg & Murray	Grates	31.36
14	Jno. C. Parker	Knives for pencil pointer	.65
15	Arthur C. Davis	Setting up machinery	18.00
17	Mackall Bros	Chemicals	65.19
	Z. D. Gilman	Pipettes	40.63
	do	Apparatus	7.96
	Rudolph, West & Co	Hardware	9.77
	Wagner Typewriter Co	Card attachment	4.50
19	Stephenson's Express	Transportation	3.67
20	Bates Manufacturing Co	Repairing machine, etc	1.75
	The Okonite Co., Ltd	Wire	1.75
	H. C. Roberts Electric Supply Co	Batteries	.40
	do	do	4.80
	The Chesapeake Electric Co	Salammoniac	.70
	Arthur C. Davis	Brick foundation	7.00
21	U. S. Electric Lighting Co	Electric lights	10.23
	Washington Gas Light Co	Gas	11.70
26	F. P. May & Co	Dowels	.15
	do	Dowel sticks	.15
29	Thos. Somerville & Sons	Steam traps	12.97
	do	Tanks, etc	17.38
	Church & Stephenson	Lumber	25.78
31	Emil Schlichting et al	Salaries	127.35
	E. G. Runyan et al	do	454.90
	Total second quarter		2,614.73
1901.			
Jan. 3	Clark & Mills	Machines for road testing	345.00
	Whitall, Tatum & Co	Beakers, etc	70.46
	Bausch & Lomb Optical Co	Condensers	19.20
4	Eimer & Amend	Burettes	6.00
	do	Pipettes	7.50
	do	Jars	12.60
	do	Repairing, etc	12.65
	do	Burettes	24.00
7	United States Express Co	Transportation	2.53
14	Jas. B. Lambie	Hardware	16.59
	Hugh Reilly	Glass	6.93
	Chas. R. Edmonston	Stone jars	2.70
	The W. W. Biggs' Heating and Ventilating Co.	Valves	3.50
	The Smith-Premier Typewriter Co	Repairs to typewriter	6.50
	M. DuPerow	Buzzers, etc	1.60
	Rudolph, West & Co	Locks, etc	2.52
	Mackall Bros	Chemicals	19.60
	Z. D. Gilman	Clamps	15.55
16	The Witt Cornice Co	Garbage cans	6.00
	Washington Gas Light Co	Gas	9.60
	United States Electric Lighting Co	Electric current	10.35
	The Geo. W. Knox Express Co	Transportation	.25
	do	do	1.75
18	A. C. Davis	Brick foundation	12.00
	Jno. C. Parker	Indexes, etc	7.17
19	Kuttroff, Pickhardt & Co	Coal-tar colors	23.40
	Manhattan Electric Supply Co	Wire	1.25
21	Eimer & Amend	Pipettes, etc	30.25
	do	Tubes, etc	6.20
	do	Thermometers	4.00
	do	Flasks	3.90
	Whitall, Tatum & Co	Beakers	22.80
	Library Bureau	Guides	35.80
	Clark & Mills	Bricket machine	165.00
22	National Electric Supply Co	Bushing	.46
	Thos. Somerville & Sons	Pipe, etc	54.80
24	W. S. Jenks	Pans	2.40
	Hugh Reilly	Glass	11.99
26	F. P. May & Co	Food chopper	1.50
	M. Shughrue	Repairs to tank	4.00
	Eimer & Amend	Flasks	7.50
29	W. B. Moses & Sons	Oilcloth	.75
	Forsberg & Murray	Fitting machinery	2.50
30	Hugh Reilly	Glass	1.08
	Mackall Bros	Chemicals	73.64
31	A. W. Bache et al	Salaries	118.00
	E. G. Runyan et al	do	608.90
Feb. 1	Whitall, Tatum & Co	Flasks	11.48
	do	Jars	6.16

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

LABORATORY—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
Feb. 1	The Spring Torsion Balance Co	Scale	$23.50
5	Eimer & Amend	Spirits and weights	13.00
	do	Glass tube, etc	2.25
	Capital City Motor Co	Hangers and pulleys	11.50
8	Dulin & Martin Co	Filter and jar	14.25
	Frederick Carl	Repairing balance	5.00
11	Chas. C. Van Horn	Mantle and chimney	3.20
	M. Du Perow	Electric lamp	5.04
12	Barber & Ross	Pliers, etc	3.00
	The Chesapeake and Potomac Telephone Co	Telephone rent	6.25
21	Stephenson's Express Co	Transportation	4.25
26	Hugh Reilly	Glass	1.78
	Church & Stephenson	Lumber	3.94
	do	do	.48
	Louis Hartig	Catches and tacks	1.28
	Rudolph, West & Co	Screws, etc	.89
	United States Electric Lighting Co	Electric current	20.78
	Washington Gas Light Co	Gas	10.60
27	Adams Express Co	Transportation	20.27
28	Library Bureau	Cards	3.00
	Merck & Co	Chemicals	.97
	Bausch & Lomb Optical Co	Gauze	3.60
	R. H. Macy & Co	China dishes	3.57
	National Electrical Supply Co	Bushing	1.00
	A. W. Bache et al	Salaries	87.00
	E. G. Runyan et al	do	544.20
Mar. 1	Thos. Somerville & Sons	Plugs, etc	24.39
	Z. D. Gilman	Filter paper, etc	79.52
5	Mackall Bros	Chemicals	32.20
	James B. Lambie	Hardware	18.45
	do	do	7.56
14	Rudolph, West & Co	Hose, etc	3.62
18	Z. D. Gilman	Glass, spoons, etc	4.35
	Bausch & Lomb Optical Co	Glass funnels	2.00
	Whital, Tatum & Co	Beakers	27.43
19	Chas. W. Butler	Repairing locks and keys	6.00
21	Church & Stephenson	Lumber	7.91
	do	do	.42
23	Eimer & Amend	Chemicals	2.25
	Crosby Steam Gage and Valve Co	Fittings for laboratory	7.86
25	Mackall Bros	Chemicals	87.50
	Hugh Reilly	Glass	3.75
	Washington Gaslight Co	Gas	15.00
	United States Electric Lighting Co	Electric current	22.81
30	A. W. Bache	Salary	30.00
	E. G. Runyan et al	Salaries	610.90
	Total third quarter		3,608.81
Apr. 2	The Warren W. Biggs Heating and Ventilating Co.	Thermometers	2.00
	R. P. Clarke Co	Sheeting	.83
3	Queen & Co., incorporated	Selenite films	1.50
10	Jas. B. Lambie	Hardware	2.70
	Rudolph, West & Co	Locks	.74
	R. P. Clarke Co	Toweling	12.50
	Z. D. Gilman	Bottles, etc	46.40
	Eimer & Amend	Paints	.55
12	The Zanesville Stoneware Co	Covers and rings	12.40
	Bausch & Lomb Optical Co	Cylinders	25.10
16	Library Bureau	Metric rules	1.15
	M. Du Perow	Electric supplies	11.45
	Barber & Ross	Tile	7.75
17	The American Distributing Co	Alcohol	23.21
18	The Baker & Adamson Chemical Co	Filters	1.82
19	D. Frank Parker	Typewriter ribbons	1.13
20	Jno. C. Parker	Fountain pen	3.50
	Mackall Bros	Chemicals	11.95
	United States Electric Lighting Co	Electric current	19.38
	Washington Gaslight Co	Gas	13.70
22	Thos. Somerville & Sons	Laboratory fittings	59.92
27	Adams Express Co	Transportation	9.72
30	A. W. Bache	Salary	30.00
	E. G. Runyan et al	Salaries	669.41
May 1	B. P. Murray	Gas	6.00
	E. J. Pullman	Photographic hydrometer	.40
2	The Okonite Co., limited	Wire	7.50
3	United States Express Co	Transportation	13.60
6	The Cutler-Hammer Manufacturing Co	Coils for rheostat	.60
13	Whitall, Tatum & Co	Flasks	5.96

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

LABORATORY—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
May 13	F. W. Huddleson	Hellebore	$0.40
	Anderson & Howison	Moving engine	10.00
	Jas. S. Topham	Sample case	1.75
16	United States Electric Lighting Co	Electric current	18.73
	Mackall Bros	Chemicals, etc	68.98
	The Chesapeake and Potomac Telephone Co.	Telephone rent	6.25
	Z. D. Gilman	Rubber tubing	34.91
17	Rudolph, West & Co	Brushes	1.10
20	The Kny-Scheerer Co	Desiccators, etc	13.51
	Whitall, Tatum & Co	Beakers	14.89
24	Bausch & Lomb Optical Co	Brushes	3.00
27	Church & Stephenson	Lumber	4.16
31	E. G. Runyan et al	Salaries	586.80
	A. W. Bache	Salary	30.00
June 14	J. T. Walker Sons	Lime	.75
15	Arthur Given	Services	5.27
21	A. A. Winfield	Yeast	1.00
	Church & Stephenson	Lumber	1.44
	The Smith Premier Typewriter Co	Key cushions	5.00
	Lewis Schultz	Buckwheat	1.00
28	Geo. F. Muth & Co	Brushes	.91
29	E. G. Runyan et al	Salaries	795.00
	Total fourth quarter		2,607.72
	Supplemental.		
July 19	United States Electric Lighting Co	Electric current	8.24
Aug. 12	The Geo. W. Knox Express Co	Transportation	10.80
19	Geo. F. Muth & Co	Putz pomade	.60
	E. Morrison Paper Co	Paper	12.25
21	Jno. C. Parker	Binding cases	10.64
Sept. 4	Mackall Bros	Chemicals	2.43
	Total		44.96

RECAPITULATION.

First quarter	$2,047.25
Second quarter	2,614.73
Third quarter	3,608.81
Fourth quarter	2,607.72
Supplemental	44.96
Total	10,923.47

LABORATORY.

[Appropriation for 1900–1901.]

Date.	Name.	Nature of payment.	Total.
1900.			
July 28	Geo. A. Shehan	Lumber	$5.91
Aug. 3	M. Du Perow	Rotary fans	20.50
14	Mackall Bros	Chemicals	13.21
	Wagner Typewriter Co	Typewriter	62.50
	Mackall Bros	do	5.78
	Rudolph, West & Co	Hardware	2.05
	Z. D. Gilman	Rubber tubing, etc	94.38
25	do	Crucibles, etc	157.58
	do	Beef juice	33.59
	Church & Stephenson	Lumber	53.09
	F. P. May & Co	Dowel sticks	.30
	J. L. Mathy	Altering vegetable pots	6.00
	Z. D. Gilman	Sesame oil, etc	.90
29	United States Electric Lighting Co	Electric current	8.65
	Washington Gaslight Co	Gas	2.80
	D. Frank Parker	Stencil paper, etc	5.15
	Thos. Somerville & Sons	Valves, etc	6.77
	M. Du Perow	Fan	10.50
	E. S. West	Photographing, etc	43.96
	C. Engels Sons	Canned goods	5.30
Sept. 5	W. G. Sargent	Hose mender's compound	1.20

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

LABORATORY—Continued.

Date.	Name.	Nature of payment.	Total.
1900.			
Sept. 5	C. Becker	Weights	$10.20
7	Library Bureau	Index cards	12.40
	The J. C. Ergood Co	Sugar	1.56
	Z. D. Gilman	Bottles and tubes	104.95
	Eimer & Amend	Condensers	36.00
	do	Flasks, etc	30.45
	Bausch & Lomb Optical Co	Funnels, etc	58.00
12	Rudolph, West & Co	Lock, rope, etc	11.47
15	H. O. Wilbur	Asbestos covering, etc	7.00
17	J. H. Bunnell & Co	Electric switch	.22
	Chas. R. Edmonston	Kettles	1.20
	Jas. B. Lambie	Hinges	.57
18	Mittay & Volger	Carbon paper	.80
	Total first quarter		814.74
Oct. 2	Hugh Reilly	Glass	1.25
4	Library Bureau	Pamphlet cases	24.00
	The Randolph Paper Box Co	Boxes	22.50
10	Woodward & Lothrop	Sheeting, etc	8.90
12	Mackall Bros	Ether, etc	81.03
16	Roethlisberger & Gerber	Samples cheese	1.21
	Meyer & Lange	do	.99
	A. L. Reynolds	do	.88
	do	do	.88
	D. C. Reynolds & Co	do	.90
	Roethlisberger & Gerber	do	2.13
	Rudolph, West & Co	Wire	.25
	Z. D. Gilman	Funnels	57.60
20	Thos. Somerville & Sons	Pans, etc	13.46
29	Jno. C. Parker	Cases	5.80
30	National Electrical Supply Co	Wire	.70
	Church & Stephenson	Lumber	39.90
	Barber & Ross	Card holder	2.25
	J. T. Walker Sons	Lime	.75
	E. Morrison Paper Co	Stamp rack	1.25
	Z. D. Gilman	Bottles, corks, etc	9.60
	do	Filters	7.60
Nov. 1	The American Distributing Co	Alcohol	45.50
2	Eimer & Amend	Flasks	7.00
17	Mackall Bros	Chemicals	132.53
	do	do	21.50
27	Z. D. Gilman	Filters	13.30
Dec. 17	Jas. B. Lambie	Iron	1.65
20	Library Bureau	Records case	55.00
	Total second quarter		560.28
1901.			
Jan. 3	The American Distributing Co	Alcohol	23.14
4	Eimer & Amend	Pippettes	4.00
	S. Galle & Co	Cheese	19.60
14	W. S. Jenks	Pans	3.00
16	The Keasbey & Mattison Co	Pipe covering	7.03
21	Bausch & Lomb Optical Co	Glass desiccators, etc	29.40
26	Eimer & Amend	Balance	22.62
29	Jas. B. Lambie	Hooks and eyes	.35
	Total third quarter		109.14
Apr. 3	Bausch & Lomb Optical Co	Dishes, etc	110.88
12	Menier	Food samples	.36
	Gregory & Brown & Co	Wall paper samples	5.00
	A. L. Reynolds	Cheese	1.58
	Haggerty Bros. & Co	Butter	6.60
	C. Sorensen	Cocoa	.50
June 4	Washington Gaslight Co	Gas	15.60
27	United States Electric Lighting Co	Electric current	14.59
	Washington Gaslight Co	Gas	13.80
	Total fourth quarter		168.91
	Supplemental.		
July 2	Jas. B. Lambie	Belting	7.77
	Thos. Somerville & Sons	Pipes, traps, etc	5.24
	do	Cement, etc	12.01
	Warren M. Whyte	Pipe	.75
	Wm. H. Dyer	Pulleys	3.00
5	Adams Express Co	Transportation	16.63

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

LABORATORY—Continued.

Date.	Name.	Nature of payment.	Total.
	Supplemental—Continued.		
1901.			
July 8	Mackall Bros	Sodium	$1.50
9	Fred. A. Schmidt	Drawing board, etc	6.08
13	R. P. Clarke Co	Toweling	12.50
	Warren M. Whyte	Disks	1.60
	Rudolph West & Co	Hardware	9.53
17	Church & Stephenson	Lumber	2.40
10	J. Dujardin	Apparatus	50.29
	Washington Gaslight Co	Gas	9.40
26	J. P. Nawrath	Sponges	7.00
Aug. 1	Z. D. Gilman	Filters, etc	71.10
16	M. du Perow	Belts	1.10
	Stephenson's Express	Transportation	3.47
19	Jas. B. Lambie	Rod and drills	6.10
21	Chesapeake and Potomac Telephone Co	Service	6.25
22	Whitall, Tatum & Co	Beakers	35.49
	The Smith Premier Typewriter Co	Repairs to typewriters	1.00
Sept. 13	Thos. Sommerville & Sons	Brass rings	2.63
	Total		272.84

RECAPITULATION.

First quarter	$814.74
Second quarter	560.28
Third quarter	109.14
Fourth quarter	168.91
Supplemental	272.84
Total	1,925.91

RENT OF BUILDING.

Date.	Name.	Nature of payment.	Total.
1900.			
Aug. 21	J. Harrison Johnson & Son	Rent	$208.33
Sept. 24	do	do	208.33
	Total first quarter		416.66
Oct. 25	J. Harrison Johnson & Son	Rent	208.33
Nov. 15	do	do	208.33
Dec. 26	do	do	208.33
	Total second quarter		624.99
1901.			
Jan. 17	J. Harrison Johnson & Son	Rent	208.33
Feb. 11	do	do	208.33
Mar. 18	do	do	208.33
	Total third quarter		624.99
Apr. 9	J. Harrison Johnson & Son	Rent	208.33
May 10	do	do	208.33
June 11	do	do	208.33
	Total fourth quarter		624.99
	Supplemental.		
Aug. 19	J. Harrison Johnson & Son	Rent	208.33
	Total		2,499.96

ADULTERATION OF FOOD AND INVESTIGATION OF SOILS.

1900.			
July 25	Whitall, Tatum & Co	Jars	$18.90
31	G. E. Patrick et al	Salaries	982.61
Aug. 1	E. Morrison Paper Co	Bags	97
14	J. L. Mathy	Tin cans	9.00
21	S. Kann, Sons & Co	Silk and yarn	5.34

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

ADULTERATION OF FOOD AND INVESTIGATION OF SOILS—Continued.

Date.	Name.	Nature of payment.	Total.
1900.			
Aug. 31	Geo. E. Patrick et al	Salaries	$866.40
Sept. 27	W. D. Biglow	Traveling expenses	86.45
	do	Expenses	36.42
29	Geo. E. Patrick et al	Salaries	851.20
	Total first quarter		2,857.29
Oct. 12	Maryland Agricultural Experiment Stations.	Wheat	2.55
31	G. E. Patrick et al	Salaries	861.22
Nov. 2	Emile Dubois	Salary	100.00
13	do	do	476.00
14	W. B. Alwood	Salary and expenses	190.00
30	Geo. E. Patrick et al	Salaries	811.44
Dec. 6	W. B. Alwood	Services	193.00
17	Z. D. Gilman	Preservatives, etc	19.30
	Houghton & Delano	Photo supplies	5.24
31	G. E. Patrick et al	Salaries	807.30
	Total second quarter		3,466.05
1901.			
Jan. 7	United States Express Co	Transportation	1.05
12	E. McK. Chace	Services	7.83
14	Houghton & Delano	Hydrochinon, etc	3.35
16	E. McK. Chace	Traveling expenses	8.20
	The Geo. W. Knox Express Co	Transportation	1.10
18	W. B. Alwood	Expenses	6.51
	do	do	15.29
	do	do	10.37
	do	Traveling expenses	21.10
	do	do	35.42
	do	Salary	101.33
	do	Traveling expenses	39.66
	do	Salary	193.00
19	W. D. Biglow	Expenses	74.93
21	Bausch & Lomb Optical Co	Crucible tongs	22.50
26	W. D. Biglow	Expenses	24.93
29	Jas. B. Lambie	Bolts, etc	1.81
31	Chas. C. Moore, jr., et al	Salaries	809.60
Feb. 21	W. B. Alwood	Salary	193.00
	do	Traveling expenses	21.09
27	Adams Express Co	Transportation	5.26
	Emile Dubois	Traveling expenses	98.36
	do	Expenses	7.76
28	Chas. C. Moore, jr., et al	Salaries	744.31
Mar. 2	E. S. Wertz	Negatives	7.45
27	Chas. C. Moore, jr	Traveling expenses	7.00
	E. S. Wertz	Negatives	61.09
30	Chas. C. Moore, jr., et al	Salaries	720.00
	Total third quarter		3,243.30
Apr. 2	W. B. Alwood	Expenses	40.71
	do	Traveling expenses	33.30
	do	Salary	271.16
16	G. E. Patrick	Traveling expenses	2.89
	do	Expenses	4.67
22	Southern Rwy. Co	Passenger transportation	15.20
27	United States Express Co	Transportation	12.95
	Adams Express Co	do	17.11
30	Chas. C. Moore, jr., et al	Salaries	641.08
May 4	W. D. Biglow	Expenses	5.30
20	Chas. C. Moore, jr	do	37.65
31	M. S. Tidd et al	Salaries	701.26
June 14	The Geo. W. Knox Express Co	Transportation	9.66
21	Z. D. Gilman	Crucibles, etc	67.83
	Eimer & Amend	Beakers, etc	3.81
	The American Distributing Co	Alcohol	22.62
	Emil Greiner	Tubes	10.45
28	Dulin & Martin Co	Knife, etc	.55
29	M. S. Tidd et al	Salaries	547.40
	Total fourth quarter		2,445.60
	Supplemental.		
July 5	Adams Express Co	Transportation	.85
8	Mackall Bros	Chemicals	223.85
	F. E. Singleton	Capsules	5.40

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

ADULTERATION OF FOOD AND INVESTIGATION OF SOILS—Continued.

Date.	Name.	Nature of payment.	Total.
	Supplemental—Continued.		
1901.			
July 9	H. E. Roberts Electric Supply Co	Batteries	$4.80
13	Mackall Bros	Chemicals	42.00
16	Christian Becker	Weights	32.40
	Mackall Bros	Chloroform, etc	38.20
19	Standard Oil Co	Gasoline	4.00
24	Chas. C. Moore, jr	Expenses	13.20
	Doremus Manufacturing Co	Lacquering polariscope	3.50
	C. A. Muddiman & Co	Hose attachments	2.40
25	Whitall, Tatum & Co	Flasks	35.47
26	W. D. Biglow	Expenses	19.25
Aug. 1	M. A. Schovell	Experiments on gluten of wheat	50.00
	L. G. Carpenter	do	50.00
	C. S. Plumb	do	50.00
	E. W. Hilgard	do	50.00
	H. J. Waters	do	50.00
	H. J. Patterson	do	50.00
2	Church & Stephenson	Lumber	4.25
3	Z. D. Gilman	Filters, etc	108.22
9	Thos. Somerville & Sons	Vise	1.75
19	Jas. B. Lambie	Can opener, etc	2.85
	Rudolph. West & Co	Zinc	1.65
	F. P. May & Co	Drug mill	12.50
30	W. B. Alwood	Transportation	7.91
Oct. 2	The Holtz & Freystedt Co	Sausage	1.52
10	Bausch & Lomb Optical Co	Condensers	29.40
11	The Geo. W. Knox Express Co	Transportation	6.02
	do	do	3.49
	Total		904.88

RECAPITULATION.

First quarter	$2,857.29
Second quarter	3,466.05
Third quarter	3,243.30
Fourth quarter	2,445.60
Supplemental	904.88
Total	12,917.12

FORESTRY INVESTIGATIONS.

Date.	Name.	Nature of payment.	Total.
1900.			
July 14	Thos. C. Carson	Traveling expenses	$10.50
23	Kinsley Twining, jr	do	11.45
26	J. W. Toumey	do	39.75
31	Geo. B. Sudworth et al	Salaries	1,181.50
Aug. 9	W. W. Everett	Salary	25.30
10	Houghton & Delano	Burnishers	186.90
	do	Rolls, films, etc	89.40
11	Wm. James, jr	Services	25.30
	C. C. Manning	do	25.30
	W. E. Tracy	do	25.30
	A. R. Powers	do	25.30
	L. W. Symmes	do	25.30
	A. L. Hyde	do	25.30
	H. T. Van Dyke	do	25.30
	Geo. L. Clothier	do	84.20
	G. F. Schwarz	do	191.10
	F. E. Olmsted	do	60.60
	J. H. Nicholl	do	25.30
	J. D. Ireland	do	25.30
	B. C. Rumsay, jr	do	25.30
	Geo. A. Morison	do	25.30
	Wm. P. Haines	do	25.30
	E. M. Griffith	do	126.40
	Wm. L. Hall	do	101.10
	C. S. Crandall	do	168.50
	Harry J. Tompkins	do	25.30
	T. L. Duncan	do	25.30
	P. S. Riggs	do	21.20
	Geo. E. Clement	do	25.30
	Eugene S. Bruce	do	126.40
	G. W. Parsons	do	25.30

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

FORESTRY INVESTIGATIONS—Continued.

Date.	Name.	Nature of payment.	Total.
1900.			
Aug. 11	H. Hus	Services	$25.30
	R. B. Rutter	do	25.30
	E. O. Wooten	do	151.60
	G. W. Eddy	do	25.30
	Norman G. Lind	do	25.30
	R. D. Swales	do	25.30
	Smith Riley	do	50.50
	F. H. Danker	do	5.71
	W. J. Gardner	do	23.64
	Ralph S. Hosmer	do	101.10
	R. E. Benedict	do	25.30
	Kinsley Twining, jr	do	25.30
	E. C. Greene	do	25.30
	F. Carter, jr	do	25.30
	A. F. Hawes	do	25.30
	Thos. H. Sherrard	do	84.20
	H. S. Meekham	do	42.10
	C. R. Pettis	do	25.30
	Jno. Foley	do	60.60
	H. L. Fairchild	do	25.30
	Anson E. Cohoon	do	25.30
	W. H. B. Kent	do	25.30
	Hiram Hurlburt	do	25.30
	C. Du Bois	do	25.30
	J. Z. Henley	do	25.30
	E. T. Allen	do	84.20
	T. P. Lukens	do	25.30
	Hugh McC. Curran	do	25.30
	H. B. Kempton	do	25.30
	Gordon W. Baker	do	15.49
	O. W. Price	do	84.20
	Wm. C. Hodge, jr	do	25.30
	Edwd. Ingraham	do	25.30
	T. S. Woolsey, jr	do	25.30
	Filibert Roth	do	168.50
	Chas. Mohr	do	126.40
	W. W. Clarke	do	12.23
	R. T. Fisher	do	60.60
	Alex. Brown	do	25.30
14	W. B. Moses & Sons	Ice chest	9.15
	R. P. Clarke Co	Flannel	6.49
	Houghton & Delano	Kodaks	40.00
	H. H. Brown	Paper	1.00
16	E. T. Allen	Expenses	35.85
	W. W. Clark	Traveling expenses	39.40
	H. J. Tompkins	do	35.40
	W. C. Hodge	do	24.35
	Jas. D. Ireland	Services	3.26
	H. B. Kempton	Expenses	2.14
	do	do	2.33
	do	do	4.36
	do	do	8.37
	do	do	9.78
	do	do	12.56
	do	do	14.03
	do	do	22.61
	do	do	94.50
	C. R. Pettis	Traveling expenses	35.25
	Chas. S. Chapman	Services	25.30
17	G. Fred. Schwarz	Expenses	59.85
	do	do	47.22
	L. H. Pammel	Traveling expenses	28.70
	E. O. Wooten	Expenses	99.50
	R. T. Fisher	Traveling expenses	196.10
	E. M. Griffith	do	82.10
	do	Office expenses	185.33
18	W. L. Hall	Traveling expenses	130.20
	E. T. Allen	do	112.25
	F. E. Olmsted	do	172.35
20	Queen & Co., incorporated	Magnifiers, etc	63.60
22	J. W. Toumey	Salary	168.50
	Wm. D. Sterrett	do	25.30
	Jno. W. Perry	do	17.12
	C. G. Pearce	do	25.30
	John Foley	Traveling expenses	27.70
	W. C. Lodge	Salary	17.12
31	Geo. B. Sudworth et al	Salaries	1,127.61
Sept. 4	O. W. Price	Traveling expenses	83.20
	Henry S. Graves	do	60.12
	do	Expenses	6.66

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

FORESTRY INVESTIGATIONS—Continued.

Date.	Name.	Nature of payment.	Total.
1900.			
Sept. 4	Filibert Roth	Traveling expenses	$196.55
5	T. P. Lukens	Expenses	39.00
	do	Traveling expenses	42.05
	H. B. Kempton	do	25.65
	C. R. Pettis	do	17.28
	Geo. L. Clothier	do	62.29
	E. T. Allen	do	80.35
	R. T. Fisher	do	197 56
	Wm. Walter	Camera case	20.75
	W. L. Hall	Salary	101.10
	G. F. Schwarz	do	101.10
	Geo. L. Clothier	do	84.20
	E. T. Allen	do	84.20
	R. T. Fisher	do	60.60
	L. C. Miller	do	50.60
	Z. L. Bliss	do	50.60
	C. D. Burson	do	50.60
	Leonard Bronson	do	50.60
	Wilson Peck	do	50.60
	L. H. Pammel	do	50.60
	Jno. E. Keach	do	50.60
	H. S. Mukham	do	42.10
	F. N. Nevins	do	28.56
	G. W. Parsons	do	18.75
	Wm. E. Tracy	do	18.75
	H. Hus	do	18.75
	G. W. Eddy	do	18.75
	A. L. Hyde	do	18.75
	W. D. Sterrett	do	25.30
	F. McC. Curran	do	25.30
	F. Carter, jr	do	25.30
	E. C. Greene	do	25.30
	A. F. Hawes	do	25.30
	G. E. Clement	do	25.30
	Henry S. Graves	do	25.30
	Coert DuBois	do	25.30
	Filibert Roth	do	168.50
	Chas. Mohr	do	126.40
	E. S. Bruce	do	126.40
	J. G. Jack	do	303.20
	W. H. B. Kent	do	25.30
	T. L. Duncan	do	25.30
	Wm. James, jr	do	25.30
	R. D. Swales	do	25.30
	H. B. Kempton	do	25.30
	W. C. Hodge, jr	do	25.30
	J. Z. Henley	do	25.30
	A. E. Coboon	do	25.30
	C. G. Pearce	do	25.30
	T. S. Woolsey, jr	do	25.30
	T. P. Lukens	do	25.30
	C. S. Chapman	do	25.30
	W. J. Gardner	do	25.30
	J. W. Toumey	do	25.30
6	H. L. Fairchild	do	25.30
	C. S. Crandall	do	168.50
	W. P. Haines	do	25.30
	E. M. Griffith	do	126.40
	Gordon M. Barker	do	3.26
	T. F. Borst	do	50.60
	Chas. E. Bessey	do	50.60
	Jno. W. Clark	do	50.60
	Wm. F. Fox	do	50.60
	Thos. C. Carson	do	50.60
	W. W. Clark	do	25.30
	Smith Riley	do	50.50
	Kingsley Twining, jr	do	25.30
	C. R. Pettis	do	25.30
	Thos. H. Sherrard	do	84.20
	R. S. Hosmer	do	101.10
	Wm. L. Bray	do	50.56
	C. C. Manning	do	3.20
	F. E. Olmsted	do	60.60
	H. J. Tompkins	do	25.30
	Jno. Foley	do	60.60
	P. S. Riggs	do	25.30
7	Pen Carbon Manifold Co	Pen carbon books	9.00
	Emil Greiner	Graduate	1.50
	Hugh Reilly	Glass	2.40
	Jas. S. Topham	Map case	4.25

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

FORESTRY INVESTIGATIONS—Continued.

Date.	Name.	Nature of payment.	Total.
1900.			
Sept. 11	H. J. Tompkins	Traveling expenses	$31.80
13	W. W. Everette	Salary	25.30
	R. T. Fisher	Traveling expenses	172.80
	J. G. Jack	do	138.75
	do	Expenses	51.15
	Wm. L. Hall	do	101.39
	E. T. Allen	do	143.90
	H. B. Kempton	do	65.12
	do	Traveling expenses	143.02
15	Houghton & Delano	Photo supplies	134.40
	O. J. J. Luebkert	Expenses	87.90
	A. F. Hawes	Services	10.60
	N. G. Lind	do	25.30
	W. R. Dudley	do	50.60
	Chas. Jones	do	46.50
	Wm. D. Sterrett	do	8.97
17	S. P. Johnson	Typewriters, etc	423.75
	W. W. Clark	Traveling expenses	19.49
21	Crescent City Transportation Co	Transportation	20.00
	Thos. H. Sherrard	Traveling expenses	34.14
	The Rio Grande Western Rwy. Co	Passenger transportation	2.00
	Montgomery & Co	Tally registers	22.50
22	E. C. Greene	Salary	14.67
	F. W. Nevins	do	14.67
	Theo. F. Borst	do	20.00
	The Pullman Co	Passenger transportation	8.50
	Boston and Albany R. R. Co	do	22.00
	Southern California Rwy. Co	do	77.75
	Burlington and Missouri River R. R. in Nebraska.	do	70.59
	Edward Ingraham	Salary	25.30
	R. E. Bennedict	do	25.30
	R. B. Rutter	do	25.30
	L. H. Pammel	Traveling expenses	17.50
	do	Expenses	101.50
	B. C. Rumsey, jr	Salary	25.30
24	Keuffel & Esser Co	Calipers, etc	124.95
	Wm. L. Hall	Expenses	31.28
27	Houghton & Delano	Photo supplies	351.46
29	G. B. Sudworth et al	Salaries	1,069.88
	Total first quarter		15,433.32
Oct. 1	Thos. H. Sherrard	Traveling expenses	69.54
	G. E. Clement	do	23.75
	Geo. L. Clothier	do	82.57
	J. G. Jack	do	135.85
	do	Expenses	19.98
	R. T. Fisher	Traveling expenses	125.50
	E. T. Allen	Expenses	152.70
	do	Traveling expenses	80.35
	L. H. Pammel	Expenses	137.75
	E. M. Griffith	do	248.07
	do	Traveling expenses	36.75
	F. E. Olmsted	do	47.85
	D. Frank Parker	Typewriter	20.00
2	E. M. Griffith	Salary	122.20
	P. S. Riggs	do	24.40
	W. H. Mast	do	75.00
	Chas. H. Mull	do	75.00
	W. R. Dudley	do	24.40
	G. A. Morison	do	25.30
	W. H. B. Kent	do	24.40
	H. McC. Curran	do	24.40
	W. J. Gardner	do	24.40
	E. O. Wooten	do	151.60
	W. W. Everett	do	24.40
	T. L. Duncan	do	24.40
	A. E. Cohoon	do	24.40
	C. S. Crandall	do	163.00
	Chas. Mohr	do	122.20
	W. L. Bray	do	24.40
	Chas. E. Bessey	do	24.40
	Leonard Bronson	do	24.40
	T. P. Lukins	do	24.40
	L. H. Pammel	do	24.40
	L. C. Miller	do	24.40
	Z. L. Bliss	do	24.40
	H. B. Kempton	do	24.40

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

FORESTRY INVESTIGATIONS—Continued.

Date.	Name.	Nature of payment.	Total.
1900.			
Oct. 2	Jno. Foley	Salary	$58.80
	J. Z. Henley	do	24.40
	O. W. Price	Traveling expenses	141.55
	Gifford Pinchot	do	81.84
3	R. D. Swales	Salary	24.40
	E. T. Allen	do	81.60
	T. H. Sherrard	do	81.60
	Wm. L. Hall	do	97.80
	W. C. Hodge, jr	do	24.40
	Smith Riley	do	49.00
	Filibert Roth	do	163.00
	Geo. L. Clothier	do	81.60
	R. T. Fisher	do	58.80
	R. S. Hosmer	do	97.80
	F. E. Olmsted	do	58.80
	G. Fred Schwarz	do	97.80
	B. C. Benner	do	43.23
	W. F. Fox	do	24.40
	Eugene F. Bruce	do	122.20
	Theo. F. Borst	do	6.52
	A. F. Yaggy	do	4.89
	F. Carter, jr	do	20.38
	C. G. Pearce	do	6.52
	J. W. Toumey	do	24.40
	do	Traveling expenses	19.40
	Edwd. Ingraham	Salary	11.41
	William James, jr	do	8.15
	J. W. Clark	do	24.40
	H. S. Meekham	do	40.80
	T. C. Carson	do	12.23
	Henry S. Graves	Traveling expenses	33.18
	do	Salary	24.40
4	H. J. Tompkins	do	24.40
5	Hiram Hurlburt	do	23.64
	Chicago and Northwestern Rwy. Co	Passenger transportation	34.25
	Union Pacific R. R. Co	do	15.00
	Fremont, Elkhorn and Missouri Valley Rwy. Co.	do	9.95
	The Chicago, Burlington and Quincy R. R. Co.	do	40.25
	Baltimore and Ohio R. R. Co	do	45.50
	The Rio Grande Western Rwy. Co	do	36.25
	Hobbs, Wall & Co., incorporated	do	60.00
9	H. J. Tompkins	Traveling expenses	70.09
10	Wm. L. Hall	do	171.84
	Chas. Jones	do	10.75
	J. G. Jack	Salary	73.37
12	H. B. Kempton	Expenses	61.01
	G. Fred. Schwarz	Traveling expenses	26.15
	do	Expenses, August	156.40
	do	Expenses, September	71.80
	do	Expenses, July	14.35
15	Amberg File and Index Co	Indexes	9.90
	Wm. P. Haines	Traveling expenses	81.15
16	O. W. Price	do	35.80
	H. J. Tompkins	do	14.50
	H. B. Kempton	do	45.58
	Houghton & Delano	Plates, etc	22.32
18	W. L. Hall	Expenses	47.61
	do	Traveling expenses	203.82
19	Geo. L. Clothier	do	81.10
	E. T. Allen	Expenses	41.25
	do	Traveling expenses	207.45
23	F. E. Olmsted	do	324.81
	G. Fred. Schwarz	do	51.30
	Paterson Bros	Hatchets	21.60
24	Southern Rwy. Co	Passenger transportation	18.73
	New York Central and Hudson River R. R. Co.	do	21.90
	Munising Rwy. Co	do	11.87
	Pennsylvania R. R. Co	do	211.21
	do	do	14.12
	The Wabash R. R. Co	do	19.00
	St. Louis Southwestern Rwy. Co	do	38.28
	Missouri Pacific Rwy. Co	do	228.80
	Jno. C. Parker	Pencil sharpener	3.00
25	Houghton & Delano	Photo supplies	41.50
26	E. O. Wooten	Traveling expenses	23.20
	C. G. Smith	do	18.00
	E. M. Griffith	Expenses	291.72

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

FORESTRY INVESTIGATIONS—Continued.

Date.	Name.	Nature of payment.	Total.
1900.			
Oct. 26	E. M. Griffith	Traveling expenses	$74.30
	T. D. Lukens	do	66.08
	do	do	39.65
30	Postal Telegraph Cable Co	Telegraph service	3.30
	Geo. F. Muth & Co	Varnish	1.25
	S. P. Johnson	Platen	10.00
	Victor B. Fay	Salary	25.30
	do	do	4.89
	Mackall Bros	Chemicals	4.50
31	G. B. Sudworth et al	Salaries	1,472.09
Nov. 1	W. H. Mast	Salary	8.15
	C. S. Crandall	do	168.50
	R. T. Fisher	do	60.60
	J. W. Toumey	do	25.30
	H. S. Graves	do	25.30
	Treadwell Cleveland, jr	do	25.30
	W. W. Everett	do	25.30
	E. S. Bruce	do	126.40
	H. S. Meekham	do	42.10
	G. F. Schwarz	do	101.10
	C. S. Chapman	do	24.40
	H. L. Fairchild	do	49.70
	H. McC. Curran	do	25.30
	C. D. Burson	do	49.70
	W. L. Bray	do	25.30
	W. R. Dudley	do	25.30
	F. L. Clarke	do	83.97
	T. P. Ludkens	do	25.30
	G. L. Clothier	do	84.20
	W. H. B. Kent	do	25.30
	T. L. Duncan	do	13.04
	P. S. Riggs	do	25.30
	A. E. Cohoon	do	25.30
	F. E. Olmsted	do	60.60
	W. C. Hodge, jr	do	25.30
	Jno. Foley	do	60.60
	E. T. Allen	do	84.20
	Chas. Mohr	do	126.40
	E. O. Wooten	do	73.37
	T. H. Sherrard	do	84.20
	Filibert Roth	Traveling expenses	229.30
	do	do	255.25
	J. G. Jack	do	86.50
	do	Expenses	2.70
	Queen & Co., incorporated	Compasses	5.50
	P. G. Huston	Traveling expenses	17.50
2	Jno. C. Keach	Salary	13.04
	T. H. Sherrard	Traveling expenses	51.38
	J. E. Keach	do	11.90
	Library Bureau	Folders and case	35.25
	A. M. Collins Manufacturing Co	Cards	36.75
	Mackall Bros	Acid, bottles, etc	24.66
	The Chesapeake and Potomac Telephone Co.	Telephone rent	6.25
3	W. L. Hall	Salary	101.10
	E. M. Griffith	do	126.40
	C. G. Smith	do	16.30
	N. S. Shaler	do	25.30
	Jno. H. Nicoll	do	2.45
	L. C. Miller	do	25.30
	Z. L. Bliss	do	25.30
	H. B. Kempton	do	25.30
	W. F. Fox	do	25.30
	Geo. A. Morison	do	29.29
	Emily A. Long et al	Labor	109.70
5	Houghton & Delano	Photo supplies	44.30
6	Burlington and Missouri River R. R. in Nebr.	Passenger transportation	60.45
	Northern Pacific Rwy. Co	do	41.70
9	H. B. Kempton	Traveling expenses	83.37
10	A. C. Ringland	do	7.30
	H. D. Tiemann	do	7.75
12	Silas C. Mason	Salary	25.30
	L. H. Pammel	do	25.30
	G. E. Clement	do	24.40
	E. T. Allen	Traveling expenses	87.00
	Chas. S. Chapman	do	28.18
13	W. L. Hall	Expenses	39.52
14	E. M. Griffith	do	262.25
	do	Traveling expenses	55.55

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

FORESTRY INVESTIGATIONS—Continued.

Date.	Name.	Nature of payment.	Total.
1900.			
Nov. 14	F. E. Olmsted	Traveling expenses	$6.00
16	E. O. Wooten	Expenses	155.58
	Geo. L. Clothier	Traveling expenses	79.70
	W. C. Hodge, jr	do	21.25
	J. W. Toumey	do	19.50
	P. S. Riggs	Services	4.89
	R. P. Imes	Salary	25.80
	R. E. Benedict	do	49.70
	Karl H. Fenning	do	49.70
17	H. B. Kempton	Expenses	25.88
21	C. S. Crandall	Traveling expenses	485.63
	Wm. L. Hall	do	182.32
24	Pennsylvania R. R. Co	Passenger transportation	29.90
	Ralph S. Hosmer	Traveling expenses	23.13
26	E. T. Allen	Expenses	29.25
27	Thos. Somerville & Sons	Pipe, etc	3.00
	S. P. Johnson	Platen, etc	7.00
	R. T. Fisher	Expenses	20.85
	do	Traveling expenses	225.75
	Houghton & Delano	Photo supplies	61.50
	G. S. Cleland	Traveling expenses	24.80
	W. C. Chadeayne	do	13.25
30	G. B. Sudworth et al	Salaries	2,381.14
Dec. 1	Wm. C. Hodge, jr	Salary	24.40
	F. P. Lukens	do	24.40
	W. W. Everett	do	24.40
	Jno. E. Keach	do	24.40
	Hugh McC. Curran	do	24.40
	Wm. F. Fox	do	24.40
	L. H. Pammel	do	24.40
	Wm. L. Bray	do	24.40
	W. R. Dudley	do	24.40
	Karl H. Fenning	do	24.40
	R. P. Imes	do	24.40
	R. E. Benedict	do	24.40
	N. S. Shaler	do	24.40
	W. H. B. Kent	do	24.40
	Silas C. Mason	do	24.40
	G. Fred Schwarz	do	24.40
	A. E. Cohoon	do	24.40
	Jno. Foley	do	58.80
	Geo. L. Clothier	do	81.60
	F. E. Olmsted	do	81.60
	Chas. Mohr	do	122.20
	E. M. Griffith	do	122.20
	E. S. Bruce	do	122.20
	C. S. Crandell	do	163.00
	Smith Riley	do	49.00
	W. J. Gardner	do	49.70
	C. E. Bessie	do	49.70
	Leonard Bronson	do	49.70
	H. S. Graves	do	24.40
	do	Traveling expenses	21.31
	Treadwell Cleveland, jr	Salary	24.40
	J. W. Toumey	do	24.40
	H. S. Meekham	do	40.80
	H. B. Kempton	Expenses	178.50
3	Library Bureau	Cards	9.65
	D. Frank Parker	Carbon paper	25.70
5	Richard L. Lamb	Numbering	19.00
	W. B. Moses & Sons	Cooler and stand	8.10
	New York, New Haven and Hartford R. R. Co.	Passenger transportation	9.75
	Canadian Pacific Rwy. Co	do	23.50
	Baltimore and Ohio R. R. Co	do	6.00
	The Wabash R. R. Co	do	11.75
	Chicago, Milwaukee and St. Paul Rwy. Co	do	13.93
	The Kansas City Southern R. R. Co	do	10.00
	Chicago and Northwestern Rwy. Co	do	8.46
	Burlington and Missouri River R. R. in Nebraska.	do	349.50
6	Robt. D. Swales	Salary	49.70
	Z. D. Gilman	Cotton	2.00
10	E. T. Allen	Traveling expenses	54.00
	P. G. Huston	do	10.70
11	C. D. Burson	Salary	24.40
	H. L. Fairchild	do	24.40
	J. W. Toumey	Traveling expenses	69.25
	Keuffel & Essex Co	Scale pen, etc	19.08
	Alice C. Foster	Lantern slide	20.25

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

FORESTRY INVESTIGATIONS—Continued.

Date.	Name.	Nature of payment.	Total.
1900.			
Dec. 11	F. E. Olmsted	Traveling expenses	$157.90
14	J. E. Keach	do	10.70
	Jno. Foley	do	27.30
	Queen & Co., Inc	Paper	8.00
	H. B. Kempton	Traveling expenses	29.07
17	Mackall Bros	Chemicals	3.47
18	Library Bureau	Guides, cards, etc	40.05
19	W. F. Bender	Salary	9.78
21	Smith Riley	do	50.50
	John E. Keach	Traveling expenses	21.55
26	Geo. L. Clothier	do	79.22
	Houghton & Delano	Photo supplies	41.26
29	Jno. W. Riggs	Salary	24.40
31	G. B. Sudworth et al	Salaries	3,344.35
	Total, second quarter		22,635.86
1901.			
Jan. 2	Union Pacific R. R. Co	Passenger transportation	4.59
	Northern Pacific Rwy. Co	do	96.00
	The Colorado and Southern Rwy. Co	do	44.75
	The Pullman Co	do	60.50
	Pennsylvania R. R. Co	do	17.00
	Southern Rwy. Co	do	18.20
	N. S. Shaler	Salary	25.30
	Smith Riley	do	50.50
	L. H. Pammel	do	25.30
	W. W. Everett	do	25.30
	W. R. Dudley	do	25.30
	Leonard Bronson	do	25.30
	C. D. Burson	do	25.30
	C. E. Bessey	do	25.30
	Treadwell Cleveland, jr	do	25.30
	W. L. Bray	do	25.30
	Chas. Mohr	do	126.40
	F. E. Olmsted	do	84.20
	Geo. L. Clothier	do	84.20
	S. C. Mason	do	25.30
	Wm. F. Fox	do	25.30
	H. S. Graves	do	25.30
	G. Fred Schwarz	do	25.30
	Herman L. Fairchild	do	25.30
	J. W. Toumey	do	25.30
3	The Scovill & Adams Co., of New York	Photo supplies	131.75
4	Robt. D. Swales	Salary	25.30
	Jno. Foley	do	60.60
5	Silas C. Mason	Traveling expenses	50.00
	Geo. L. Clothier	do	99.41
7	United States Express Co	Transportation	4.45
14	Houghton & Delano	Photo supplies	134.42
	Chas. R. Edmonston	Camp outfit	37.98
	Rudolph, West & Co	Hardware	6.04
	Mackall Bros	Chemicals	6.85
16	Jno. W. Riggs	Salary	25.30
	E. S. Bruce	Traveling expenses	6.50
17	Wm. H. Mast	do	28.83
18	Jas. W. Toumey	do	14.45
	Henry S. Graves	do	22.30
	E. M. Griffith	do	430.83
	do	Expenses	85.00
19	P. G. Huston	Salary	25.30
21	A. M. Collins Manufacturing Co	Cards	42.50
	Amberg File and Index Co	Transfer cases	15.49
	Library Bureau	Cards and bookrest	31.00
22	Jno. C. Parker	Paper	4.50
	Thos. Somerville & Sons	Washers	.20
	W. B. Moses & Sons	Costumers	9.60
23	O. J. J. Luebkirt	Expenses	56.70
24	F. E. Olmsted	Traveling expenses	81.53
26	Chas. S. Chapman	do	42.10
28	Jno. Foley	do	40.10
	Robt. D. Swales	do	25.75
	T. A. Sherrard	Expenses	12.35
29	do	Traveling expenses	39.64
30	Jno. W. Riggs	do	56.02
	T. P. Lukens	Expenses	5.00
	H. S. Graves	Traveling expenses	21.50
31	G. B. Sudworth et al	Salaries	4,197.48
Feb. 2	Houghton & Delano	Lantern plates	2.55
4	Lida Draper	Labor	1.29

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd

FORESTRY INVESTIGATIONS—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
Feb. 4	Laidee Luttrell	Labor	$1.29
	S. C. Ford	do	2.58
	Elsie B. Stabler	do	3.87
6	The Chesapeake and Ohio Rwy. Co	Passenger transportation	57.10
	The Atchison, Topeka and Santa Fe Rwy	do	5.52
	The Pullman Co	do	14.00
	Pere Marquette R. R. Co	do	20.22
	New York, New Haven and Hartford R. R. Co.	do	12.25
	Pennsylvania R. R. Co	do	16.93
	Leonard Bronson	Salary	25.80
	C. D. Burson	do	25.80
	C. E. Bessey	do	25.80
	L. H. Pammel	do	25.80
	W. W. Everett	do	25.80
	W. L. Bray	do	25.80
	W. R. Dudley	do	25.80
	Jno. W. Riggs	do	25.80
	Silas C. Mason	do	25.80
	T. P. Lukens	do	51.10
	J. W. Toumey	do	25.80
	Treadwell Cleveland, jr	do	25.80
	Henry S. Graves	do	25.80
	H. L. Fairchild	do	25.80
	Wm. F. Fox	do	25.80
	G. Fred. Schwartz	do	25.80
	T. P. Lukens	Traveling expenses	2.65
	Henry S. Graves	do	22.25
	O. A. Danzenbaker	Pipe covering	4.32
7	H. M. Suter	Traveling expenses	29.50
8	Mackall Bros	Chemicals	58.32
	E. Reese	Negatives	40.50
9	H. M. Curran	Traveling expenses	19.78
11	E. M. Griffith	do	103.58
	Queen & Co., Inc	Tracing cloth	18.15
12	The Chesapeake and Potomac Telephone Co.	Telephone rent	6.25
	do	do	3.19
13	F. E. Olmsted	Freight charges	7.95
14	E. S. Bruce	Traveling expenses	92.22
16	J. W. Toumey	do	23.25
	Herbert A. Smith	Salary	53.33
	G. E. Clement	do	16.45
18	O. W. Pierce	Traveling expenses	23.80
19	Houghton & Delano	Photo supplies	84.35
	Ludwig Tesdorf	Instruments	119.59
20	The Press Clipping Bureau	Clippings	27.12
	M. G. Copeland & Co	Tent	49.27
	H. H. Chapman	Salary	25.80
	N. S. Shaler	do	25.80
21	D. F. Parker	Mimeograph ink	2.25
	W. B. Moses & Sons	Furniture	92.70
	Alice C. Foster	Lantern slides, etc	25.15
	Queen & Co., Inc	Cross-section paper	19.20
23	G. E. Clement	Traveling expenses	36.70
	Houghton & Delano	Kodaks, etc	195.00
	Western Union Telegraph Co	Telegraph service	47.36
26	George F. Muth & Co	Glass	17.50
	Fred A. Schmidt	Magnifying glass, etc	2.80
27	Chicago, Rock Island and Pacific Rwy. Co	Passenger transportation	134.86
	New York, New Haven and Hartford R. R. Co.	do	5.00
	Jno. W. Riggs	Expenses	16.05
	do	do	4.27
	Adams Express Co	Transportation	21.37
28	Keuffel & Esser Co	Ink	12.06
	G. B. Sudworth et al	Salaries	4,297.89
Mar. 1	H. A. Smith	Salary	93.40
	C. E. Bessey	do	23.40
	W. W. Everett	do	23.40
	T. P. Lukins	do	23.40
	Wm. L. Bray	do	23.40
	Silas C. Mason	do	23.40
	L. H. Pammel	do	23.40
	C. D. Burson	do	23.40
	Wm. F. Fox	do	23.40
	Herman L. Fairchilds	do	23.40
	J. W. Toumey	do	23.40
	Henry S. Graves	do	23.40
	G. F. Schwarz	do	23.40

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

FORESTRY INVESTIGATIONS—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
Mar. 1	Treadwell Cleveland, jr	Salary	$23.40
9	Herman H. Chapman	do	23.40
	Leonard Bronson	do	23.40
	W. R. Dudley	do	23.40
11	H. M. Curran	Traveling expenses	18.57
12	Chas. S. Chapman	Services	26.45
13	Jas. S. Topham	Repairs to lantern	3.00
14	S. P. Johnson	Mimeograph sheets	7.40
	Church & Stephenson	Lumber	46.85
	Rudolph, West & Co	Hardware, etc	8.66
	The Geo. W. Knox Express Co	Transportation	.57
16	H. S. Graves	Traveling expenses	187.50
	N. S. Shaler	Salary	23.40
	Jno. W. Riggs	do	23.40
18	Library Bureau	Cards	30.19
19	Fred. A. Schmidt	Blue-print paper	1.50
	Mackall Bros	Chemicals	19.67
21	J. Manz Engraving Co	Engraving	12.00
	D. Frank Parker	Mimeograph paper	29.50
22	Geo. L. Clothier	Traveling expenses	51.19
23	Houghton & Delano	Photographic supplies	59.00
25	Jno. W. Riggs	Traveling expenses	18.29
	Church & Stephenson	Lumber	9.00
	United States Electric Lighting Co	Lamps	4.64
27	E. T. Allen	Traveling expenses	20.00
	R. Carter Ballantyne	Cyclone paper	44.85
30	Geo. B. Sudworth et al	Salaries	4,645.73
	Total third quarter		18,965.05
Apr. 1	Jno. C. Parker	Bookcase	39.50
	Henry Brooks	Salary	14.17
	Wm. F. Fox	do	25.80
	Henry S. Graves	do	25.80
	J. W. Toumey	do	25.80
	Treadwell Cleveland, jr	do	25.80
	H. M. Fairchild	do	25.80
	G. Fred. Schwarz	do	25.80
	Geo. L. Clothier	do	86.10
	T. P. Lukins	do	25.80
	Silas C. Mason	do	25.80
	L. H. Pammel	do	25.80
	Jno. W. Riggs	do	25.80
	C. E. Bessey	do	25.80
	W. R. Dudley	do	25.80
	H. H. Chapman	do	25.80
	C. D. Burson	do	25.80
	Leonard Bronson	do	25.80
	Boston and Maine R. R. Co	Passenger transportation	7.85
	The Missouri Pacific Rwy. Co	do	55.80
	do	do	28.60
	Pennsylvania R. R. Co	do	33.35
	do	do	12.15
	St. Louis Southwestern Rwy. Co	do	14.25
	New York Central and Hudson River R. R. Co.	do	14.60
	do	do	8.10
	Boston and Albany R. R. Co	do	9.61
	Philadelphia and Reading Rwy. Co	do	10.70
2	Wm. L. Bray	Salary	25.80
	T. Balfour	do	49.20
	Houghton & Delano	Photographic supplies	44.80
	W. B. Moses & Sons	Oilcloth	3.00
	Jas. S. Topham	Kodak case	4.50
3	Thos. H. Sherrard	Traveling expenses	55.50
	Chas. Parsons	Book	3.50
	Keuffel & Esser Co	Paper	4.94
6	Jas. S. Topham	Camera cases	10.00
	Houghton & Delano	Films, etc	13.30
8	W. W. Everett	Salary	25.80
9	Church & Stephenson	Lumber	15.12
	The Maurice Joyce Engraving Co	Engraving	2.50
	Rudolph, West & Co	Hardware	12.23
	Z. D. Gilman	Funnels	2.25
11	R. P. Clarke Co	Cheese cloth	2.24
	Ernest Betz	Stove	11.00
	H. A. Smith	Services	91.00
12	N. S. Shaler	Salary	25.80
	Emil Greiner	Graduates	3.65
	Simpson & Co	Log rule	5.00

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

FORESTRY INVESTIGATIONS—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
Apr. 12	Library Bureau	Case and cards	$63.90
16	do	File case and guides	45.00
	Geo. L. Clothier	Expenses	11.35
	H. B. Kempton	Traveling expenses	28.32
	Mackall Bros	Chemicals	8.75
	Henry Grinnell	Traveling expenses	59.60
17	O. W. Price	do	46.00
18	Geo. L. Clothier	do	75.62
19	Wm. Walter	Repairing instruments	16.75
	Jas. S. Topham	Map case	31.50
20	E. M. Griffith	Traveling expenses	44.20
	R. P. Clarke Co	Cotton flannel	1.00
	Geo. B. Donavin & Co	Field ranges, etc	84.00
	Queen & Co., Inc	Aneroid barometers	90.39
	Houghton & Delano	Photographic supplies	27.20
	Chicago, Burlington and Quincy R. R. Co.	Transportation	.15
	Burlington and Missouri River R. R. in Nebraska.	do	.65
22	The New York, New Haven and Hartford R. R. Co.	Passenger transportation	12.25
	Baltimore and Ohio R. R. Co	do	15.30
23	Jas. B. Lyon	Cuts	37.00
25	The Press Clipping Bureau	Clippings	19.94
	Felt & Tarrant Manufacturing Co	Comptometer	125.00
	Keuffel & Esser Co	Levels, chains, etc	74.93
	A. M. Collins Manufacturing Co	Cards, etc	61.93
	Amberg File and Index Co	Indexes	4.50
	Chas. R. Edmonston	Camp outfit	20.62
	Sheetz & Bishop	Lantern slides	7.50
	D. Frank Parker	Mimeograph ink and paper	16.75
27	Ordnance Department of U. S. Army	Saddle, etc	23.54
	United States Express Co	Transportation	3.80
	Adams Express Co	do	14.51
29	Jno. Humphrey	Calipers	3.50
	New York, New Haven and Hartford R. R. Co.	Transportation	.82
30	J. V. Doniphan	Salary	32.14
	Geo. B. Sudworth et al	Salaries	3,978.16
May 1	Jas. S. Topham	Camera case	4.50
	Eugene S. Bruce	Salary	123.60
	Geo. L. Clothier	do	82.40
	J. W. Riggs	do	24.70
	H. H. Chapman	do	24.70
	L. H. Pammel	do	24.70
	R. P. Imes	do	24.70
	Wm. L. Bray	do	24.70
	Wm. C. Hodge, jr	do	49.50
	C. D. Burson	do	24.70
	T. Balfour	do	24.70
	R. E. Benedict	do	24.70
	S. C. Mason	do	24.70
	C. E. Bessey	do	24.70
	H. B. Kempton	do	59.30
	Wm. F. Fox	do	24.70
	J. W. Toumey	do	24.70
	N. S. Shaler	do	24.70
	H. M. Fairchild	do	24.70
	G. Fred Schwarz	do	24.70
	H. M. Sutter	do	24.70
3	The Chesapeake & Potomac Telephone Co.	Telephone rent	11.38
	do	do	6.25
8	Western Union Telegraph Co	Telegraph services	13.10
9	Geo. L. Clothier	Traveling expenses	56.58
	L. C. Miller	do	6.60
	R. S. Kellogg	Expenses	28.90
	T. P. Lukins	Salary	24.70
	W. R. Dudley	do	24.70
13	H. C. Roberts Electric Supply Co	Batteries	2.00
16	Church & Stepenson	Lumber	17.62
	H. B. Kempton	Traveling expenses	109.69
	W. K. Shepard	do	26.55
	Eugene S. Bruce	do	54.75
17	Rudolph, West & Co	Hatchets	11.00
	do	Making chests	4.01
	E. S. Newman	Copyholder	2.50
	Wm. Walter	Blank holder	30.00
20	Amberg File and Index Co	Indexes	8.60
	do	do	5.80
	A. I. V. Chatfield	Salary	50.00
	H. A. Smith	do	84.70

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

FORESTRY INVESTIGATIONS—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
May 20	H. S. Graves	Salary	$24.70
	Treadwell Cleveland, jr	do	24.70
	R. S. Kellogg	Traveling expenses	15.99
	W. L. Wallace	Salary	24.70
	W. W. Everett	do	24.70
	L. Bronson	do	24.70
	Houghton & Delano	Photographic supplies	126.46
	R. T. Fisher	Traveling expenses	5.00
21	Littlefield, Alvord & Co	Moving Forestry Division	59.00
24	J. W. Riggs	Expenses	35.00
	H. McCurran	Salary	39.60
27	Pennsylvania R. R. Co	Passenger transportation	30.41
	Savannah, Florida and Western Ry. Co	do	7.10
28	Western Union Telegraph Co	Telegraph service	8.97
	do	do	21.44
31	Geo. B. Sudworth et al	Salaries	3,191.13
June 1	H. S. Graves	Salary	78.25
	do	do	25.60
	W. K. Shepard	do	1.00
	P. G. Huston	do	25.60
	J. E. Keach	do	29.01
	W. L. Wallace	do	25.60
	W. R. Dudley	do	25.60
	W. W. Everett	do	25.60
	A. C. Ringland	do	25.60
	H. M. Sutter	do	25.60
	C. D. Burson	do	25.60
	R. P. Imes	do	25.60
	S. C. Mason	do	25.60
	W. C. Chadeayne	do	25.60
	F. Tompkins	do	25.60
	T. Balfour	do	25.60
	C. G. Smith	do	26.60
	R. E. Benedict	do	25.60
	J. W. Riggs	do	25.60
	T. P. Lukens	do	25.60
	W. L. Bray	do	25.60
	G. S. Cleland	do	85.20
	F. E. Olmsted	do	20.60
	E. H. Hareford	do	119.20
	W. L. Hall	do	5.27
	A. E. Cahoon	do	50.00
	A. I. V. Chatfield	do	100.50
	Smith Riley	do	25.60
	J. V. Doniphan	do	25.60
	H. D. Tiemann	do	25.60
	H. L. Fairchild	do	25.60
	T. Cleveland, jr	do	25.60
	G. F. Schwarz	do	25.60
	H. Brooks	do	25.60
3	J. W. Toumey	do	127.80
	E. S. Bruce	do	25.60
	W. F. Fox	do	25.60
	N. S. Shaler	do	25.60
	L. H. Pammel	do	25.60
	C. E. Bessey	do	85.20
	Geo. L. Clothier	do	25.60
	H. H. Chapman	do	32.45
4	Southern Rwy. Co	Passenger transportation	84.00
5	H. A. Smith	Salary	3.85
7	S. B. Gregory	Services	16.35
11	Geo. L. Clothier	Expenses	15.95
	M. Du Perow	Buzzers, etc	1.00
	Wm. Walter	Repairing tripod	10.00
	Geo. F. Muth & Co	Plate glass	7.35
	Geo. Shilling	Tapes	10.00
	Jas. S. Topham	Camera cases	6.50
	Fred. A. Schmidt	Cloth	.50
	The Maurice Joyce Engraving Co	Engraving autograph	75.40
13	Houghton & Delano	Photo supplies	46.73
	do	do	21.60
	do	Films	9.86
	Rudolph, West & Co	Rules, etc	4.57
	do	Padlock, etc	17.85
14	Adams Express Co	Transportation	.30
	The Chesapeake and Potomac Telephone Co	Service	9.10
	Queen & Co., Inc	Repairing aneroids	19.56
15	Mackall Bros	Chemicals, etc	5.50
	Richd. L. Lamb	Stamps	9.48
17	Wm. L. Hall	Expenses	

Expenditures of Department of Argiculture for year ending June 30, 1901—Cont'd.

FORESTRY INVESTIGATIONS—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
June 17	R. S. Kellogg	Expenses	$4.95
	Church & Stephenson	Lumber	8.42
18	Wm. H. Mast	Traveling expenses	6.15
	Eugene S. Bruce	do	62.91
	Manhattan Electrical Supply Co	Wire, etc	5.00
	Queen & Co., Inc	Chairs, etc	104.10
	A. M. Collins Manufacturing Co	Cards	16.00
	C. P. Goerz	Shutter	56.34
	The J. W. F. Dorman Co	Type holder	9.25
	Woodruff Manufacturing Co	File case	176.50
	Lawyer & Wagner	Camera, etc	32.50
19	Jas. B. Lambie	Nails	2.95
20	W. C. Hodge, jr	Salary	51.00
21	Pen-Carbon Manifold Co	Letter book	9.00
	Library Bureau	Oak case	5.00
	Western Union Telegraph Co	Service	7.20
	do	do	5.01
	do	do	7.35
	do	do	13.70
22	W. H. B. Kent	Traveling expenses	26.86
	H. B. Kempton	Salary	61.40
25	Pennsylvania R. R. Co	Passenger transportation	14.60
	New York, New Haven & Hartford R. R. Co	do	24.50
	Maine Central R. R. Co	do	12.00
	Boston and Maine R. R. Co	do	12.00
	The Chesapeake and Ohio Rwy. Co	do	55.25
	Southern Rwy. Co	do	38.80
29	G. B. Sudworth et al	Salaries	2,011.71
	Total fourth quarter		15,920.29
	Supplemental.		
July 1	H. G. Tiemann	Salary	24.70
	A. K. Chittenden	do	13.19
	H. L. Fairchild	do	24.70
	Wm. F. Fox	do	24.70
	N. S. Shaler	do	24.70
	Henry S. Graves	do	24.70
	Karl H. Fenning	do	24.70
	Tredwell Cleveland, jr	do	24.70
	Henry Brooks	do	49.40
	D. L. Nicks	do	24.70
	E. S. Bruce	do	123.60
	Henry Grinnell	do	59.30
	Coert Du Boise	do	39.60
	Wm. H. Mast	do	24.70
	H. B. Kempton	do	59.30
	H. S. Meekham	do	123.60
	J. W. Touemy	do	24.70
	E. R. Hodson	do	24.70
	W. H. B. Kent	do	5.27
	W. W. Everett	do	24.70
	H. M. Suter	do	24.70
	C. S. Chapman	do	26.37
	R. E. Benedict	do	24.70
	P. G. Huston	do	24.70
	A. C. Ringland	do	24.70
	C. G. Smith	do	24.70
	W. C. Chadeayne	do	24.70
	G. S. Cleland	do	24.70
	F. Thompkins	do	24.70
	T. P. Lukens	do	24.70
	W. L. Bray	do	24.70
	C. E. Bessey	do	24.70
	L. H. Pammel	do	24.70
	E. H. Hareford	do	24.70
	A. F. Hawes	do	39.60
	H. J. Tompkins	do	59.30
	Smith Riley	do	49.50
	F. E. Olmsted	do	82.40
	Wm. C. Hodge, jr	do	49.50
	R. S. Kellogg	do	24.70
	J. W. Riggs	do	24.70
	C. D. Burson	do	24.70
	Geo. L. Clothier	do	82.40
	H. H. Chapman	do	24.70
	L. C. Miller	do	39.60
	R. P. Imes	do	24.70
	S. C. Mason	do	24.70
	G. F. Schwarz	do	24.70

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

FORESTRY INVESTIGATIONS—Continued.

Date.	Name.	Nature of payment.	Total.
	Supplemental—Continued.		
1901.			
July 1	G. E. Clement	Salary	$13.19
	J. E. Keach	do	24.70
2	Mackall Bros	Soda, etc	2.45
	Church & Stephenson	Lumber	27.98
	W. B. Moses & Sons	Ice chests, etc	24.35
	W. H. Dyer	Electric wire	3.00
	Wm. Walter	Repairing tripod	.75
5	Security Storage Co	Storage, etc	10.00
	Herbert A. Smith	Salary	14.00
	J. V. Doniphan	do	24.70
	T. Balfour	do	24.70
	C. S. Crandall	do	170.40
	do	do	164.80
6	R. S. Kellogg	Traveling expenses	61.19
	Geo. L. Clothier	do	74.32
	W. L. Hall	Salary	115.40
	H. M. Curran	do	40.80
8	do	do	39.60
9	Houghton & Delano	Photographic supplies	6.60
10	Eugene S. Bruce	Traveling expenses	92.81
11	L. C. Miller	do	42.50
13	Wm. L. Hall	do	108.63
	Jno. C. Parker	Fasteners	1.50
	A. Ackerman	Salary	13.19
16	Anson E. Cahoon	Traveling expenses	42.65
	R. S. Kellogg	do	27.35
17	Wm. L. Hall	do	82.37
	Geo. L. Clothier	do	49.21
19	L. C. Miller	do	73.20
20	H. B. Kempton	do	124.69
23	R. S. Kellogg	Expenses	33.12
	L. C. Miller	do	15.50
26	Baltimore and Ohio R. R. Co	Passenger transportation	28.50
	The Atchison, Topeka and Santa Fe Rwy. Co.	do	3.28
31	Neely Electric Co	Annunciator	4.00
	D. C. Crain	Engraving	3.60
Aug. 2	Queen & Co., Inc	Dividers, etc	6.28
	Pennsylvania R. R. Co	Passenger transportation	54.85
	Bangor and Aroostook R. R. Co	do	16.00
	The New York, New Haven and Hartford R. R. Co.	do	5.50
3	The Maurice Joyce Engraving Co	Plate	.50
5	New York Central and Hudson River R. R. Co.	Passenger transportation	16.11
6	W. R. Dudley	Salary	24.70
	Leonard Bronson	do	24.70
	do	do	25.60
9	J. W. Toumey	Traveling expenses	11.59
12	Rudolph, West & Co	Screws, etc	.33
	The Geo. W. Knox Express Co	Transportation	3.25
	Ray L. Marston	Salary	13.19
20	Manhattan Electric Supply Co	Wire	1.69
21	Chesapeake and Potomac Telephone Co	Service	17.23
	W. L. Wallace	Salary	24.70
29	Henry S. Graves	Traveling expenses	56.25
Sept. 4	Alfred Ackerman	do	42.46
	The Press Clipping Bureau	Clippings	23.96
7	W. L. Hall	Expenses	6.40
Oct. 4	International and Great Northern R. R. Co	Passenger transportation	42.30
	Houston and Texas Central R. R. Co	do	13.40
	Missouri, Kansas and Texas Rwy. Co	do	7.85
5	Boston and Maine R. R. Co	do	6.47
	New York Central and Hudson River R. R. Co.	do	22.23
	Union Pacific R. R. Co	do	5.68
12	Postal Telegraph Cable Co	Service	6.74
	Total		3,761.32

RECAPITULATION.

First quarter	$15,433.32
Second quarter	22,635.86
Third quarter	18,965.05
Fourth quarter	15,920.29
Supplemental	3,761.32
Total	76,715.84

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

APPALACHIAN MOUNTAIN REGION.

Date.	Name.	Nature of payment.	Total.
1900.			
Aug. 16	Walter Mulford	Traveling expenses	$26.90
22	H. B. Ayres	Office expenses	88.81
	do	Traveling expenses	71.12
Sept. 5	W. W. Ashe	Salary	170.00
19	A. E. Cates	do	41.61
22	H. B. Ayres	Expenses	49.70
	Total first quarter		448.14
Oct. 3	Walter Mulford	Salary	62.83
5	C. D. Ruland	do	37.53
12	H. B. Ayres	Traveling expenses	59.14
30	J. A. Suit	do	9.75
Nov. 1	W. W. Ashe	Salary	65.80
	A. E. Cates	Labor	15.00
	W. W. Ashe	Salary	28.33
3	J. A. Suit	do	26.93
12	A. E. Cates	Traveling expenses	81.41
	do	Expenses	18.00
	H. B. Ayres	Traveling expenses	79.51
21	J. A. Suit	do	15.50
Dec. 1	do	Salary	24.40
11	W. W. Ashe	do	85.00
	Total second quarter		609.13
1901.			
Jan. 2	W. W. Ashe	Salary	85.00
16	do	Traveling expenses	380.85
	Total third quarter		465.85
Apr. 11	H. B. Ayres	Traveling expenses	92.35
	do	do	129.45
	do	do	47.50
16	do	do	102.40
	Total fourth quarter		371.70

RECAPITULATION.

First quarter	$448.14
Second quarter	609.13
Third quarter	465.85
Fourth quarter	371.70
Total	1,894.82

EXPERIMENTAL GARDENS AND GROUNDS.

Date.	Name.	Nature of payment.	Total.
1900.			
July 7	Christopher Hayes	Packing moss	$10.00
21	do	do	60.00
31	Jas. K. Kerr et al	Salaries	1,551.37
Aug. 3	Paul Hiser, jr., & Bro	Flower pots	40.00
11	Christopher Hayes	Peat	24.00
14	Hugh Reilly	Glass	30.00
	Ernest Betz	Making iron pan	1.50
	Thos. Somerville & Sons	Tanks	5.50
	Rudolph, West & Co	Hardware	3.94
21	United States Electric Lighting Co	Electric light	77.50
25	Church & Stephenson	Lumber	38.75
31	Jas. K. Kerr et al	Salaries	1,559.20
Sept. 7	Exter Machine Works	Repairing boiler	13.50
	Henry A. Dreer, Incorporated	Smilax plants	2.50
12	United States Electric Lighting Co	Lighting grounds	77.50
	Ernest Betz	Pipe	4.50
15	Chas. Becker	Lead	3.00
29	Jas. K. Kerr et al	Salaries	1,612.07
	Total first quarter		5,114.83
Oct. 10	Edw. S. Schmidt	Plant stakes	32.50
12	Church & Stephenson	Lumber	57.00
	Chas. Becker	Oil	33.00

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

EXPERIMENTAL GARDENS AND GROUNDS—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
Oct. 16	United States Electric Lighting Co	Lighting grounds	$71.92
24	W. A. Manda	Bulbs	88.00
27	Matthew Myers	Manure	37.56
30	Geo. F. Muth & Co	Lead, tools, etc	39.52
	Hugh Reilly	Paints	13.16
	Forsberg & Murray	Boiler plate	.75
31	Jas. K. Kerr et al	Salaries	1,928.32
Nov. 1	Chas. Brent	Grass seeds	14.00
	J. T. Brown	Manure	45.00
2	The Cottage Gardens	Carnations	16.00
14	Peter Henderson & Co	Pansy plants	3.00
	G. L. Taber	Oranges, etc	9.85
16	Peter Henderson & Co	Grass seed	4.20
17	Rudolph, West & Co	Bolts and screws	2.60
	The W. W. Biggs Heating and Ventilating Co.	Tank heater	35.00
21	Church & Stephenson	Lumber	66.93
	Paul Hiser, jr., & Bro	Flower pots	43.90
	Albert M. Herr	Pansy plants	4.00
27	Thos. Somerville & Sons	Pipe, etc	30.00
30	Jas. K. Kerr et al	Salaries	1,343.55
Dec. 3	E. J. Rawlings	Japonica	1.00
	The W. W. Biggs Heating and Ventilating Co.	Radiators	26.00
6	Denys Zirngiebel	Pansy seeds	2.00
	Geo. Meier & Co	Bronze	2.13
14	A. & G. Rossbach	Plants	3.00
	Peter Henderson & Co	Plants, etc	16.29
17	Z. D. Gilman	Thermometers	15.00
	Wm. Ryan	Manure	4.00
	Church & Stephenson	Lumber	13.59
	Jno. H. Ley	Ferns	3.00
	N. Studer	Plants	20.00
	M. Du Perow	Speaking tubes	6.10
21	United States Electric Lighting Co	Arch lights	74.88
	do	Lighting grounds	73.36
29	German Seed and Plant Co	Seeds	4.30
	Jas. B. Lambie	Flatiron	.53
31	Jas. K. Kerr et al	Salaries	1,306 57
	Total second quarter		5,491.45
1901.			
Jan. 3	P. C. Berckmanns Co	Plants	17.00
	Peter Henderson & Co	Carnations	30.70
14	W. H. Butler	Paint	3.00
	Rudolph, West & Co	Screws	.69
16	United States Electric Lighting Co	Lighting grounds	77.45
19	Henry A. Dreer, Incorporated	Seeds	6.50
21	Library Bureau	Cards	2.90
24	Jas. E. Albinson	Repairs	10.60
26	Blue Line Transfer Co	Transportation	1.89
31	E. M. Byrnes et al	Salaries	1,274.05
Feb. 5	The Jno. A. Doyle Co	Roses	22.00
12	Church & Stephenson	Lumber	15.28
	The Chesapeake and Potomac Telephone Co.	Telephone rent	4.35
18	J. P. Brass	Sand	7.00
	C. Becker	Horse blankets	7.00
21	Paul Hiser, jr., & Bro	Flower pots	49.20
26	Thos. Somerville & Sons	Plumbing	6.29
	Geo. F. Muth & Co	Lanterns	1.00
	J. T. Walker Sons	Lime	.75
	United States Electric Lighting Co	Electric lights	77.50
27	Edwd. S. Schmidt	Nicotine	3.60
	Adams Express Co	Transportation	.55
28	The Draper Manufacturing Co	Charts	1.56
	E. M. Byrnes et al	Salaries	1,211.10
Mar. 5	Mackall Bros	Soap	6.00
	Jas. B. Lambie	Files, etc	3.50
14	Rudolph, West & Co	Padlocks	3.51
	do	Hooks, etc	7.02
18	Paul Hiser, jr., & Bro	Flower pots	35.00
19	Thos. Somerville & Sons	Boiler fittings	7.36
21	Church & Stephenson	Lumber	41.54
23	Peter Henderson & Co	Labels	7.18
25	Rudolph, West & Co	Wire cloth	19.08
	United States Electric Lighting Co	Lighting grounds	69.44
30	E. M. Byrnes et al	Salaries	1,293.91
	Total third quarter		4,325.50

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

EXPERIMENTAL GARDENS AND GROUNDS—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
Apr. 2	J. T. Walker Sons	Lime	$25.00
	Ernest Betz	Repairs to boiler	3.25
	E. S. Schmid	Nicoticide	7.00
	Paul Hiser, jr., & Bro	Flower pots	60.00
9	Chas. R. Edmonston	Jars	7.00
16	Rudolph, West & Co	Hardware	5.67
17	H. H. Brooke	Grass seed	3.00
18	J. P. Nawrath	Twine	2.30
20	United States Electric Lighting Co	Lighting grounds	77.50
24	Geo. F. Muth & Co	Paints	36.13
25	Peter Henderson & Co	Grass seeds	8.75
	Hiram T. Jones	Seeds	3.75
	Henry A. Dreer, Incorporated	do	9.68
	do	Plants	9.50
	Edwd. S. Schmid	Moss	1.50
	Jno. Bogle	Plants	15.00
27	Chas. White	Sod	4.25
	United States Express Co	Transportation	7.10
	Adams Express Co	do	13.65
30	E. M. Byrnes et al	Salaries	1,334.05
May 2	H. Weber & Sons	Carnations	17.00
4	S. P. Johnson	Spring for typewriter	.60
	Wyckoff, Seamans & Benedict	Repairing typewriter	21.50
13	Edwd. S. Schmid	Moss	7.50
	Henry A. Dreer, Incorporated	Chrysanthemums	5.50
16	United States Electric Lighting Co	Lighting grounds	82.50
	Edwd. S. Schmid	Punk	3.60
	The Chesapeake and Potomac Telephone Co.	Telephone service	7.00
	Jno. C. Parker	Pencil pointer	3.50
17	Rudolph, West & Co	Iron basins	1.98
	do	Hinges	.50
	Church & Stephenson	Lumber	113.49
20	Library Bureau	Cards	2.90
27	J. Louis Loose	Lily plants	18.25
28	The Geo. W. Knox Express Co	Drayage	2.85
	Jas. B. Lambie	Shears, etc	14.05
	Edwd. S. Schmid	Moss	12.00
31	E. M. Byrnes et al	Salaries	1,334.43
June 4	Ernest Betz	Sprinklers	2.75
11	Harry Hoskinson	Seeds	3.15
	Chas. Becker	Linseed oil	3.00
	Jno. C. Parker	Paraffin paper	14.25
	Edw. S. Schmid	Packing moss	7.50
	do	Hose menders	1.00
13	Jno. B. Lord	Gravel	5.00
	Rudolph, West & Co	Trowels	1.38
14	Louis Hartig	Pulley	.20
	J. M. Thorburn & Co	Lawn sprinkler	5.00
17	P. N. Heiskell, jr., & Co	Mower, etc	44.00
	do	Mower sections	5.00
	do	Rivets	.75
	Church & Stephenson	Lumber	117.25
	do	do	36.36
18	Jas. B. Lambie	Nails	5.83
	J. T. Walker Sons	Lime	6.75
	Wm. Minnis	Tinning	36.00
	C. M. Wolf & Co	Baskets	1.50
19	W. B. Moses & Sons	Cooler and stand	5.50
21	The Maurice Joyce Engraving Co	Making labels	12.50
	Chas. Becker	Oil	6.00
	Thos. W. Smith	Window frames, etc	59.75
	Church & Stephenson	Lumber	15.53
	J. W. Lynch	Plastering, etc	50.00
	C. R. Baird & Co	Sweet potatoes	1.10
25	J. T. Willard	do	.60
	Chas. Becker	Liquid granite	2.50
	Geo. F. Muth & Co	Paints, etc	3.13
27	United States Electric Lighting Co	Arc lamps	77.40
28	Rudolph, West & Co	Locks, etc	1.58
	E. Morrison Paper Co	Yellow paper	1.40
	Hugh Reilly	Paint	1.36
	do	do	1.50
29	E. M. Byrnes et al	Salaries	1,062.85
	Total fourth quarter		4,882.65
	Supplemental.		
July 2	W. H. Butler	Whiting	1.00
5	Adams Express Co	Transportation	.35

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

EXPERIMENTAL GARDENS AND GROUNDS—Continued.

Date.	Name.	Nature of payment.	Total.
	Supplemental—Continued.		
1901.			
July 5	Adams Express Co	Transportation	$10.20
13	Rudolph, West & Co	Screws	.81
	----do	Tape line, etc	2.32
17	Geo. F. Muth & Co	Wall brushes, etc	9.57
	Rudolph, West & Co	Mouse traps	2.54
18	F. S. Newcomb	Seed sweet potatoes	1.50
19	United States Express Co	Transportation	1.90
	United States Electric Lighting Co	Use arc lamp	82.31
30	Thos. W. Smith	Doors	10.89
Aug. 2	Chas. S. Brent & Bro	Seeds	8.05
12	The Geo. W. Knox Express Co	Transportation	22.90
21	The Chesapeake and Potomac Telephone Co.	Service	7.00
	----do	----do	.15
	Total		161.40

RECAPITULATION.

First quarter	$5,114.83
Second quarter	5,491.45
Third quarter	4,325.50
Fourth quarter	4,882.65
Supplemental	161.40
Total	19,975.83

SOIL INVESTIGATIONS.

Date.	Name.	Nature of payment.	Total.
1900.			
July 23	Queen & Company, Inc	Bell odometer	$5.00
31	M. L. Floyd et al	Salaries	1,311.17
Aug. 1	Eimer & Amend	Triple arrest	72.00
11	Geo. N. Coffey	Traveling expenses	17.72
	Jno. G. Holmes	Services	75.00
	J. A. Bonsteel	Salary	84.20
17	C. W. Dorsey	Office expenses	9.19
	----do	Traveling expenses	86.58
18	Frank D. Gardner	----do	85.07
	Thos. H. Means	----do	108.00
	----do	Office expenses	9.89
20	Bausch & Lomb Optical Co	Supplies	2.78
21	United States Electric Lighting Co	Light	6.66
	Washington Gas Light Co	Gas	2.20
	Macy H. Lapham	Traveling expenses	34.75
22	J. A. Bonsteel	----do	77.75
	R. T. A. Burke	----do	44.96
	Fredk. Carl	Making filter	9.70
	Milton Whitney	Traveling expenses	132.11
	Thos. Somerville & Sons	Augers	5.20
31	M. L. Floyd et al	Salaries	1,285.09
Sept. 8	----do	Traveling expenses	34.31
12	Washington Gas Light Co	Gas	3.50
13	Jno. G. Holmes	Salary	75.00
15	C. W. Dorsey	Traveling expenses	92.09
17	United States Electric Lighting Co	Electric current	7.34
	Milton Whitney	Traveling expenses	37.70
19	C. W. Dorsey	Expenses	13.72
21	New York Central and Hudson River R. R. Co.	Passenger transportation	66.80
	Frank D. Gardner	Traveling expenses	98.50
	R. T. A. Burke	----do	24.00
	J. A. Bonsteel	----do	76.05
	Macy H. Lapham	----do	29.12
24	Geo. N. Coffey	----do	53.76
29	M. L. Floyd et al	Salaries	1,295.95
	Total first quarter		5,372.86
Oct. 1	J. A. Bonsteel	Salary	165.80
4	A. Weiskettel & Son	Baking plates	17.28
	Milton Whitney	Traveling expenses	58.22
5	Pennsylvania R. R. Co	Passenger transportation	6.79

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

SOIL INVESTIGATIONS—Continued.

Date.	Name.	Nature of payment.	Total.
1900.			
Oct. 9	Jno. G. Holmes	Salary	$75.00
10	Woodward & Lothrop	Saucepans	2.70
12	J. A. Bonsteel	Traveling expenses	72.55
	Thos. H. Means	do	145.95
	do	Expenses	12.85
	Mackall Bros	Laboratory supplies	2.60
15	Whitall, Tatum & Co	Beakers	11.65
16	Houghton & Delano	Slides	1.20
	United States Electric Lighting Co	Electric current	6.55
	Washington Gas Light Co	Gas	2.60
24	Frank D. Gardner	Traveling expenses	130.60
	New York, New Haven and Hartford R. R. Co.	Passenger transportation	18.15
	Seaboard Air Line Rwy Co	do	12.05
	Southern California Rwy Co	do	77.75
	Pennsylvania R. R. Co	do	47.16
	The Rio Grande Western Rwy Co	do	6.50
	Atlantic and North Carolina R. R. Co	do	1.90
26	Thos. Means	Traveling expenses	47.95
30	C. W. Dorsey	do	155.60
	Thos. Somerville & Sons	Repairing boilers	22.70
	R. T. A. Burke	Traveling expenses	16.45
31	M. L. Floyd et al	Salaries	1,370.10
Nov. 1	Marcel Cordove	Salary	27.50
	J. A. Du Bon	do	115.00
	J. A. Bonsteel	do	84.20
	C. A. Jensen	do	40.40
	J. G. Holmes	do	75.00
3	The Chesapeake and Potomac Telephone Co.	Telephone service	6.25
	do	do	.83
7	Wm. H. Rau	Colored slides	9.50
9	C. A. Jensen	Traveling expenses	20.45
12	J. A. Bonsteel	do	66.10
17	Mackall Bros	Chemicals	13.97
	Frank D. Gardner	Traveling expenses	86.22
23	J. G. Holmes	do	171.35
24	Baltimore and Ohio R. R. Co	Passenger transportation	62.55
27	Z. D. Gilman	Triangles	1.50
	United States Electric Lighting Co	Electric current	8.54
	Washington Gas Light Co	Gas	9.70
30	M. L. Floyd et al	Salaries	1,466.00
Dec. 1	Jno. A. Du Bon	Salary	75.00
	J. A. Bonsteel	Traveling expenses	41.38
	Jno. G. Holmes	Salary	75.00
2	Emil Greiner	Tongs	4.50
	Geo. B. Massey	Traveling expenses	4.10
5	Forsberg & Murray	Smokestack	58.00
	Rudolph, West & Co	Brads, etc	.23
	Pennsylvania Co	Passenger transportation	11.75
	Atlantic Coast Line R. R. Co	do	8.60
6	M. L. Floyd	Traveling expenses	54.33
7	Milton Whitney	do	34.05
	do	do	31.60
10	J. G. Holmes	Expenses	5.75
	do	Traveling expenses	100.80
11	Fredk. Carl	Laboratory apparatus	20.80
14	P. F. Van Everen	Labels	3.00
17	Z. D. Gilman	Desiccators	15.22
	Rudolph, West & Co	Brads, etc	1.40
	M. Du Perow	Switches	2.22
	J. A. Bonsteel	Salary	81.60
18	Library Bureau	Guides	1.28
19	Jno. Springman	Grate bars	14.00
20	The Kny Sheerer Co	Burners	1.00
	Baltimore and Ohio R. R. Co	Passenger transportation	14.00
21	United States Electric Lighting Co	Electric light	8.69
	Washington Gas Light Co	Gas	7.90
26	M. L. Floyd	Traveling expenses	42.49
	Albert E. Acker & Co	Tube, coupling, etc	10.25
29	Church & Stephenson	Lumber	19.16
	do	do	39.36
	Jas. B. Lambie	Hinges	.32
31	F. D. Gardner et al	Salaries	1,619.70
	Total second quarter		7,161.19
1901.			
Jan. 2	Pennsylvania R. R. Co	Passenger transportation	48.20
	Cleveland, Cincinnati, Chicago and St. Louis Rwy. Co.	do	17.20

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

SOIL INVESTIGATIONS—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
Jan. 2	The Rio Grande and Western Rwy. Co	Passenger transportation	$100.25
	Central R. R. Co. of New Jersey	do	6.50
	Pennsylvania Co	do	11.00
	J. A. Du Bon	Salary	75.00
3	Bausch & Lomb Optical Co	Cylinders	3.32
	Whital, Tatum & Co	Beakers, etc	16.66
4	Eimer & Amend	Seives, etc	12.70
7	Mackall Bros	Chemicals	19.17
	Church & Stephenson	Lumber	6.00
12	Milton Whitney	Traveling expenses	16.19
	J. A. Bonsteel	do	6.25
	M. L. Floyd	do	26.90
14	Houghton & Delano	Photo supplies	4.99
	E. J. Pullman	do	5.80
	Chas. R. Edmontson	Filter and tube	6.55
	Barber & Ross	Steel figures	.50
	Z. D. Gilman	Jars and glasses	38.52
16	Washington Gas Light Co	Gas	10.00
18	Jno. C. Parker	Manila paper	9.68
21	Eimer & Amend	Tubes	6.25
	Whital, Tatum & Co	Glass and tubes	1.41
22	Thos. Somerville & Sons	Gas connections	1.04
24	United States Electric Lighting Co	Electric current	8.68
26	Jno. A. Du Bon	Salary	33.87
31	Frank D. Gardner et al	Salaries	1,641.50
Feb. 1	E. J. Pullman	Lantern slides	6.50
4	Geo. B. Massey	Traveling expenses	6.93
6	Southern California Rwy. Co	Passenger transportation	140.25
	do	do	54.80
	New York, New Haven and Hartford R. R. Co.	do	15.55
	do	do	6.80
	Pennsylvania Co	do	23.35
	Baltimore and Ohio R. R. Co	do	17.50
	Pennsylvania R. R. Co	do	32.55
	do	do	21.59
12	The Chesapeake and Potomac Telephone Co.	Telephone rent	6.25
	do	do	.75
19	Whital, Tatum & Co	Flasks	4.98
26	J. T. Walker Sons	Felt	.40
	Rudolph, West & Co	Turns	.81
	Z. D. Gilman	Stoppers, tubing, etc	6.40
	United States Electric Lighting Co	Electric current	8.36
	Washington Gaslight Co	Gas	14.00
27	Adams Express Co	Transportation	4.66
28	Frank D. Gardner et al	Salaries	1,523.60
Mar. 5	Milton Whitney	Traveling expenses	9.10
12	Geo. B. Massey	do	6.45
14	E. J. Pullman	Negative of map	5.00
18	Bausch & Lomb Optical Co	Laboratory supplies	11.48
	Whitall, Tatum & Co	Bottles	1.08
19	Fred. A. Schmidt	Metal tapes	10.40
	Mackall Bros	Chemicals	14.12
	M. Du Perow	Electrical supplies	3.25
21	J. Manz Engraving Co	Engraving	22.00
23	S. H. Davis & Co	Odometers	45.00
	M. L. Floyd	Traveling expenses	7.27
	do	do	23.04
25	Washington Gaslight Co	Gas	12.10
	United States Electric Lighting Co	Electric current	9.70
	The Chesapeake and Potomac Telephone Co.	Telephone service	.60
30	M. L. Floyd et al	Salaries	1,842.70
	Total third quarter		6,053.45
Apr. 1	Pennsylvania R. R. Co	Passenger transportation	6.20
	do	do	11.25
	Hannibal and St. Joseph R. R. Co	do	23.80
	Southern Pacific Co	do	3.60
	do	do	28.50
2	Jas. B. Lambie	Belting, etc	2.76
	Mackall Bros	Chemicals	5.31
	Wm. H. Dyer	Instrument cases	26.25
	Jno. W. Collins & Son	Copper boxes	6.50
	Jas. S. Topham	Trunks	30.00
	Z. D. Gilman	Desiccators, etc	13.14
3	Emil Greiner	Rubber bulbs	4.50

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

SOIL INVESTIGATIONS—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
Apr. 3	W. & L. E. Gurley	Compasses, etc	$85.85
9	Rudolph, West & Co	Auger, etc	16.96
	Z. D. Gilman	Bulbs and tubing	3.70
12	Eimer & Amend	Burettes	13.95
	Manhattan Electric Supply Co	Pliers	3.90
	Schnieder Bros	Thermometers	12.00
16	Bausch & Lomb Optical Co	Tubes, etc	7.44
19	Eimer & Amend	Air pump	23.20
	E. C. Howell	Picks	27.00
20	Houghton & Delano	Borax	.85
	United States Electric Lighting Co	Electric current	12.86
	Washington Gaslight Co	Gas	12.60
22	Thos. Somerville & Sons	Repairs to boiler	22.45
	do	Work on cylinder	1.83
	The New York, New Haven and Hartford R. R. Co.	Passenger transportation	8.75
24	Frederick Carl	Laboratory apparatus	39.70
	do	do	6.75
27	United States Express Co	Transportation	1.36
	Adams Express Co	do	2.06
30	F. K. Cameron et al	Salaries	1,579.13
May 3	The Chesapeake and Potomac Telephone Co.	Telephone rent	7.00
8	Western Union Telegraph Co	Telegraph service	4.59
	do	do	2.84
16	United States Electric Lighting Co	Electric current	13 97
17	Frederick Carl	Apparatus	11.05
27	Pennsylvania R. R. Co	Passenger transportation	18.54
	The New York, Hew Haven and Hartford R. R. Co.	do	8.75
28	Western Union Telegraph Co	Telegraph services	3.49
	do	do	3.74
	do	do	1.33
	do	do	1.65
31	F. K. Cameron et al	Salaries	1,618.60
June 4	Washington Gaslight Co	Gas	9.20
11	Z. D. Gilman	Flasks, etc	32.39
	M. Du Perow	Fan	12.90
14	Whitall, Tatum & Co	Mailing cases	11.04
15	R. Carter Ballantyne	Tags	2.10
17	Fredk. Carl	Filter pumps	24.00
18	H. C. Roberts Electrical Supply Co	Batteries	4.80
	James B. Lambie	Wrenches	2.50
21	Western Union Telegraph Co	Service	4.94
22	E. J. Pullman	Photo paper	3.00
24	E. Morrison Paper Co	Manila paper	4.50
27	United States Electric Lighting Co	Electric current	9.04
	Washington Gaslight Co	Gas	14.10
29	F. K. Cameron et al	Salaries	1,602.87
	Total fourth quarter		5,477.08
	Supplemental.		
July 2	Dulin & Martin Co	Stew pans	3.25
	Jno. R. Galloway	Fan	37.00
5	Adams Express Co	Transportation	4.37
13	Houghton & Delano	Hydrichon	.80
19	United States Electrical Co	Electric current	7.50
	Washington Gaslight Co	Gas	11.60
Aug. 3	Jno. C. Parker	Pamphlet covers	10.50
12	The Geo. W. Knox Express Co	Transportation	4.20
	do	do	1.54
21	The Chesapeake and Potomac Telephone Co.	Services	7.00
22	Z. D. Gilman	Filter tubes, etc	7.50
	Total		95.26

RECAPITULATION.

First quarter	$5,482.86
Second quarter	7,161.19
Third quarter	6,053.45
Fourth quarter	5,477.08
Supplemental	95.26
Total	24,269.84

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

SOIL INVESTIGATIONS.

[Appropriation for 1901-2.]

Date.	Name.	Nature of payment.	Total.
1901.			
Mar. 23	M. L. Floyd	Traveling expenses	$32.30
30	Geo. Russell Taggart	Salary	38.89
	Total third quarter, 1901		71.19
Apr. 1	Henriette Burley	Washing sacks	3.50
2	R. P. Clarke Co	Sheeting	3.00
4	C. W. Dorsey	Traveling expenses	8.85
8	Geo. B. Massey	do	8.50
	Jno. A. Bonsteel	do	5.47
9	E. J. Pulman	Photo supplies	7.95
10	Agnes Hinton	Making sacks	24.00
	Jas. B. Lambie	Iron	1.07
12	E. B. Shelfer	Seeds	12.00
	W. G. Smith	Traveling expenses	21.75
13	F. P. Veitch	do	17.59
16	M. H. Lapham	do	40.15
	S. P. Johnson	Caligraph	67.50
	Mackall Bros	Silver nitrate	3.43
18	J. G. Holmes	Traveling expenses	43.65
24	Whitall, Tatum & Co	Beakers	2.55
30	M. L. Floyd et al	Salaries	587.50
May 1	E. J. Pullman	Plates	7.92
	Geo. T. McNess	Salary	98.90
	W. H. Heileman	do	98.90
	J. O. Martin	do	82.40
	Chas. N. Mooney	do	40.00
	H. J. Wilder	do	40.00
	Thos. D. Rice	do	40.00
	Louis Messmer	do	40.00
	J. B. Stewart	do	40.00
	Frank Bennett, jr	do	40.00
	B. A. Olshansen	do	40.00
	W. E. Hearn	do	40.00
	E. C. McDuffie	do	40.00
	J. E. Lapham	do	40.00
	Hugh McGuigan	do	7.92
2	G. Cramer Dry Plate Co	Plates	1.25
	Defender Photo Supply Co	Blue-print paper	12.02
4	Geo. B. Massey	Traveling expenses	10.82
	Milton Whitney	do	215.45
7	J. A. Bonsteel	do	34.36
	Thos. A. Means	do	12.89
11	Geo. T. McNess	do	4.10
	E. C. McDuffie	do	13.20
13	W. & L. C. Gurley	Compasses	19.35
16	J. B. Stewart	Salary	10.85
	Mackall Bros	Chemicals	4.90
	Z. D. Gilman	Filter paper	.93
17	Thos. Somerville & Sons	Fittings	82.01
20	M. L. Floyd	Traveling expenses	13.82
	do	Expenses	6.45
	Hugh McGuigan	Salary	6.60
21	Houghton & Delano	Photo supplies	113.80
24	Chas. A. Jensen	Traveling expenses	119.55
	J. G. Holmes	do	130.47
	M. H. Lapham	do	14.55
	Eimer & Amend	Apparatus	77.00
27	Southern Rwy. Co	Passenger transportation	25.25
	Pennsylvania R. R. Co	do	4.75
28	D. F. Parker	Typewriter stand	736.50
	M. L. Floyd et al	Salaries	40.00
June 1	H. J. Wilder	Salary	40.00
	J. E. Lapham	do	85.20
	J. O. Martin	do	102.20
	Geo. T. McNess	do	40.00
	Thos. D. Rice	do	40.00
	Chas. M. Mooney	do	40.00
	F. Bennett, jr	do	40.00
	W. E. Hearn	do	40.00
	B. A. Olshansen	do	40.00
	E. C. McDuffie	do	40.00
	L. Messmer	do	102.20
	W. H. Hileman	do	17.00
4	Baltimore & Ohio R. R. Co	Passenger transportation	25.25
	Seaboard Air Line Rwy. Co	do	114.25
	Pennsylvania R. R. Co	do	304.68
	J. A. Bonsteel	Traveling expenses	

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

SOIL INVESTIGATIONS—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
June 7	C. W. Dorsey	Traveling expenses	$55.05
	W. G. Smith	do	34.52
	Geo. B. Massey	do	13.60
	Milton Whitney	do	68.44
11	M. H. Lapham	do	122.50
	Thos. H. Kearney	do	45.60
13	J. G. Holmes	do	124.65
	Chas. A. Jensen	do	120.75
14	E. J. Pullman	Carbon paper	1.20
15	Rudolph, West & Co	Augers	5.63
	R. P. Clarke & Co	Muslin	4.00
18	Western Electric Co	Coils for thermometers	6.00
22	M. L. Floyd	Traveling expenses	80.90
24	G. T. McNess	Expenses	4.50
	do	Traveling expenses	21.43
25	Pennsylvania R. R. Co	Passenger transportation	9.50
	New York, New Haven and Hartford R. R. Co.	do	4.50
	Southern Rwy. Co.	do	78.40
28	The Maurice Joyce Engraving Co	Engraving	2.80
29	J. O. Martin	Salary	82.40
	J. E. Lapham	do	40.00
	M. L. Floyd et al	Salaries	732.30
	Total fourth quarter		6,034.82

RECAPITULATION.

Third quarter	$71.19
Fourth quarter	6,034.82
Total	6,106.01

RENT OF BUILDING.

Date.	Name.	Nature of payment.	Total.
1900.			
Aug. 14	Jno. F. Shea	Rent	$55.00
Sept. 5	do	do	55.00
	Total first quarter		110.00
Oct. 20	Jno. F. Shea	Rent	55.00
Nov. 13	do	do	55.00
Dec. 6	do	do	55.00
	Total second quarter		165.00
1901.			
Jan. 7	Jno. F. Shea	Rent	55.00
Feb. 5	do	do	55.00
Mar. 2	do	do	55.00
	Total third quarter		165.00
Apr. 3	Jno. F. Shea	Rent	55.00
May 2	do	do	55.00
June 11	do	do	55.00
	Total fourth quarter		165.00
	Supplemental.		
July 17	Jno. F. Shea	Rent	55.00
	Total		660.00

GRASS AND FORAGE PLANT INVESTIGATIONS.

1900.			
July 19	Southern Printers' Supply Co	Electros	$4.25
28	Houghton & Delano	Plates, etc	8.94
	Henry H. Brown	Films	4.20
31	E. D. Merrill et al	Salaries	366.70

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

GRASS AND FORAGE PLANT INVESTIGATIONS—Continued.

Date.	Name.	Nature of payment.	Total.
1900.			
Aug. 1	Burke Bros	Kodaks, etc	$34.00
	Louis W. Carter	Salary	55.00
	H. L. Bentley	do	50.50
2	F. Lamson-Scribner	Traveling expenses	45.25
3	A. B. Leckenby	Salary	101.10
6	Elias Nelson	do	100.00
10	James R. Collins	Bushel bags	17.09
	F. Lamson-Scribner	Labor	60.00
11	Emil F. Lange	Salary	50.00
14	Houghton & Delano	Kodak	20.70
17	David Griffiths	Traveling expenses	6.50
	C. L. Shear	Office expenses	2.70
	Elias Nelson	Traveling expenses	17.35
	do	Office expenses	1.40
	H. L. Bentley	do	33.75
	Wm. Shear	Traveling expenses	16.12
	C. L. Shear	do	78.18
23	Wm. Shear	Salary	75.00
	David Griffiths	do	150.00
	Jos. B. Davy	Grasses	34.00
25	Carl R. Ball	Traveling expenses	16.40
30	Emil F. Lange	do	8.00
31	E. D. Merrill et al	Salaries	351.22
Sept. 4	Louis W. Carter	Salary	55.00
	David Griffiths	do	150.00
	A. B. Leckenby	do	101.10
	H. L. Bentley	do	50.50
	William Shear	do	75.00
	Elias Nelson	do	100.00
5	Harry N. Leckenby	Seeds	106.85
	Rudolph, West & Co	Hose, etc	17.75
	Houghton & Delano	Plates	8.74
7	Peter Henderson & Co	Grass seeds	13.55
	T. W. Wood & Sons	do	8.90
	Arthur W. Robson	Freight charges	8.82
13	Emil F. Lange	Salary	50.00
	A. B. Leckenby	Traveling expenses	32.50
15	Emil F. Lange	do	7.90
	F. Lamson-Scribner	Expenses	60.00
17	T. W. Wood & Sons	Grain	2.45
	J. J. H. Gregory	Beans	4.50
	Jas. B. Lambie	Scythe, etc	1.55
	C. R. Ball	Expenses	8.50
19	H. L. Bentley	do	29.00
	Wm. Shear	Traveling expenses	18.75
21	New York Central and Hudson River R. R. Co.	Passenger transportation	2.23
	Boston and Maine R. R. Co	do	2.56
22	Boston and Albany R. R. Co	do	8.49
	Burlington and Missouri River R. R. in Nebraska.	do	76.60
	Wm. Shear	Services	15.00
	C. L. Shear	Traveling expenses	81.60
	do	do	32.50
24	F. Lamson-Scribner	do	125.79
29	E. D. Merrill et al	Salaries	361.60
	Total first quarter		3,326.08
Oct. 1	Mackall Bros	Potash, etc	2.03
2	A. B. Leckenby	Expenses	132.35
	E. D. Merrill	Traveling expenses	150.07
5	Jas. K. Metcalfe	Seeds	32.50
	Chicago, Milwaukee and St. Paul Rwy. Co.	Passenger transportation	33.00
	Pennsylvania R. R. Co	do	79.85
	The Atchison, Topeka and Santa Fe Rwy. Co.	do	6.60
	Union Pacific R. R. Co	do	32.36
	Fremont, Elkhorn and Missouri Valley Rwy. Co.	do	7.15
	Southern Rwy. Co	do	16.25
	The Colorado and Southern Rwy. Co	do	7.65
	Blue Ridge R. R. Co	do	4.51
	Lehigh Valley R. R. Co	do	9.33
	Denver and Rio Grande R. R. Co	do	50.90
	Atlantic Coast Line R. R. Co	do	15.26
8	A. Lamson-Scribner	Traveling expenses	21.90
	do	Expenses	19.40
	F. Lamson-Scribner	do	60.00
9	Thos. A. Williams	Traveling expenses	29.60

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

GRASS AND FORAGE PLANT INVESTIGATIONS—Continued.

Date.	Name.	Nature of payment.	Total.
1900.			
Oct. 9	H. L. Bentley	Salary	$49.00
	Louis W. Carter	do	55.00
12	David Griffiths	Traveling expenses	25.30
	R. S. Rising	Grass seed	8.80
	Sheetz & Bishop	Lens	38.00
15	T. W. Wood & Sons	Seeds	29.00
	do	do	9.60
18	A. B. Leckenberg	Expenses	64.75
	do	Salary	97.80
	do	Expenses	31.70
24	Chicago and Northwestern Rwy. Co	Passenger transportation	6.15
	Northern Pacific Rwy. Co	do	32.10
	Great Northern Rwy. Co	do	46.90
	Oregon Short Line R. R. Co	do	80.50
	Union Pacific R. R. Co	do	108.55
	The Wabash R. R. Co	do	8.45
26	H. Haupt, jr	Seeds	5.00
30	Houghton & Delano	Photo supplies	16.82
31	E. D. Merrill et al	Salaries	474.21
Nov. 1	do	Traveling expenses	23.10
	David Griffiths	Salary	99.50
	H. L. Bentley	do	50.50
	A. B. Leckenberg	do	101.10
	The Publishers and Printers Engraving Co.	Engraving	19.35
	T. W. Wood & Sons	Seeds	39.70
	do	do	26.60
	do	do	22.30
	J. M. Thorburn & Co	do	20.40
2	Peter Henderson & Co	do	4.00
	T. W. Wood & Sons	do	3.36
	F. P. May & Co	Scoop and measures	17.65
	The Chesapeake & Potomac Telephone Co.	Telephone rent	6.25
6	The Rio Grande Southern R. R. Co.	Passenger transportation	33.80
	Burlington and Missouri River R. R. Co. in Nebraska.	do	31.30
	The Chesapeake and Ohio R. R. Co	do	19.50
12	B. C. Pittuck	Salary	8.15
	David Griffiths	Expenses	2.25
17	David Landreth & Sons	Seeds	5.10
19	Houghton & Delano	Photo supplies	5.72
	do	Films	4.20
20	Sheetz & Bishop	Photo supplies	12.75
21	Elias Nelson	Traveling expenses	31.00
	do	Expenses	27.00
	David Griffiths	do	32.60
	H. L. Bentley	do	7.00
23	Peter Henderson & Co	Seeds	28.50
	Houghton & Delano	Photo supplies	33.54
24	A. F. Jorss	Repairing holders	20.00
26	Thos. A. Williams	Traveling expenses	20.50
27	Z. D. Gilman	Photo paper	.60
	The Geo. W. Knox Express Co	Transportation	1.24
	United States Electric Lighting Co	Ruby lamp	.40
30	E. D. Merrill et al	Salaries	521.54
Dec. 1	Louis W. Carter	Salary	55.00
	A. B. Leckenberg	do	97.80
	do	Traveling expenses	56.45
	do	do	52.65
	Louis W. Carter	Salary	55.00
	David Griffiths	do	49.00
	B. C. Pittuck	do	24.40
3	The Publishers and Printers Engraving Co.	Engravings	33.42
	Library Bureau	Cards	18.15
	R. & J. Farquhar & Co	Seeds	7.15
	T. W. Wood & Sons	do	30.50
	Sheetz & Bishop	Photo supplies	6.75
5	New York, New Haven and Hartford R. R. Co.	Passenger transportation	15.20
	Northern Pacific Rwy. Co	do	66.00
	Baltimore and Ohio R. R. Co	do	48.25
	The Wabash R. R. Co	do	4.35
	Mark W. Johnson Seed Co	Grass seed	11.15
	Union Pacific R. R. Co	Passenger transportation	9.45
	Chicago, Milwaukee and St. Paul Rwy. Co	do	36.50
6	W. M. Freeman	Seeds	5.00
11	Seabury & Johnson	Silk isinglass	7.50
14	Wm. P. Brooke	Millet	51.50
	Jas. R. Collins	Bags	11.75

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

GRASS AND FORAGE PLANT INVESTIGATIONS—Continued.

Date.	Name.	Nature of payment.	Total.
1900.			
Dec. 15	Wood, Stubbs & Co	Seeds	$32.15
	Jas. K. Metcalfe	do	186.00
17	Mackall Bros	Chemicals	17.66
	Rudolph, West & Co	Tin, etc	17.70
18	Library Bureau	Index case and cards	45.00
19	Elmer D. Merrill	Traveling expenses	15.25
29	Church & Stephenson	Lumber	34.48
	H. L. Bentley	Expenses	16.50
	Louis W. Carter	do	50.00
31	E. D. Merrill et al	Salaries	534.85
	Total second quarter		4,881.35
1901.			
Jan. 2	H. L. Bentley	Salary	99.50
	B. C. Pittuck	do	25.30
3	T. W. Wood & Sons	Grass seeds	45.00
	Bausch & Lomb Optical Co	Triplets	4.62
	The C. A. Smurthwaite Produce Co	Seeds	316.38
5	David Griffiths	Salary	50.50
7	Mackall Bros	Potash	.90
	Church & Stephenson	Lumber	39.50
14	Houghton & Delano	Plates, etc	3.37
	E. Morrison Paper Co	Paper	24.84
	Rudolph, West & Co	Label holders	3.11
16	A. B. Leckenby	Salary	101.10
	Jas. Withycombe	do	2.77
	T. C. Ford	Grass seed	22.50
	H. Haupt, jr	do	3.00
	The Geo. W. Knox Express Co	Transportation	2.03
19	O. C. Kippenbrock	Photos	1.00
21	Peter Henderson & Co	Seeds	50.50
22	The Geo. W. Knox Express Co	Transportation	4.18
24	T. W. Wood & Sons	Seeds	54.00
26	Blue Line Transfer Co	Transportation	4.72
	Chas. S. Brent & Bro	Grass seeds	11.00
30	Texas Seed and Floral Co	do	3.55
31	E. N. Wilcox et al	Salaries	437.89
Feb. 2	D. Landreth & Sons	Seeds	52.72
	Louis Hartig	Catches	.40
	David Griffiths	Salary	51.70
6	Pennsylvania R. R. Co	Passenger transportation	30.00
11	T. W. Wood & Sons	Seeds	29.68
	Whitall, Tatum & Co	Vials, etc	5.45
	Thos. W. Smith	Lumber	.96
	Brentano's	Notebooks	4.14
12	The Chesapeake and Potomac Telephone Co.	Telephone rent	6.25
13	Peter Henderson & Co	Seeds	31.00
14	Richd. L. Lamb	Stencil	1.25
	Fredk. Springman	Transportation	.56
19	L. Cameron	Seeds	2.00
	J. M. Thorburn & Co	do	19.90
	Seabury & Johnson	Silk isinglass	7.50
21	T. W. Wood & Sons	Seeds	33.00
23	Houghton & Delano	Photo supplies	2.04
	B. C. Pittuck	Salary	25.80
	H. L. Bentley	do	51.70
26	Texas Seed and Floral Co	Seeds	40.90
	Hugh Reilly	Glass	2.40
	Richard L. Lamb	Ink	1.50
	Rudolph, West & Co	Turns and screws	.52
27	Chicago, Rock Island and Pacific Rwy. Co.	Passenger transportation	16.25
	Adams Express Co	Transportation	6.02
28	H. Nungesser & Co	Seeds	28.43
	J. M. Thorburn & Co	do	3.60
	H. Nungessor & Co	do	36.75
	E. N. Wilcox et al	Salaries	416.07
Mar. 1	Houghton & Delano	Film	5.40
	David Griffiths	Salary	46.60
5	Jas. B. Lambie	Hinges	1.28
	Henry Nungesser & Co	Seeds	6.50
	J. M. Thorburn & Co	do	30.00
9	A. B. Leckenby	Traveling expenses	75.90
	do	Expenses	24.50
12	H. Nungesser & Co	Seeds	46.40
13	E. J. Pullman	Photo mounts	11.61
14	The Geo. W. Knox Express Co	Transportation	2.32
15	J. Manz Engraving Co	Engraving	24.00
16	Carlton R. Ball	Traveling expenses	72.55
	T. W. Wood & Sons	Seeds	43.50

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

GRASS AND FORAGE PLANT INVESTIGATIONS—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
Mar. 16	T. W. Wood & Sons	Seeds	$7.95
	B. C. Pittuck	Salary	23.40
18	Jas. R. Collins	Seed bags	68.30
	Peter Henderson & Co	Seed	54.45
	do	do	17.50
	H. Nungesser & Co	do	24.50
	Hatch Experiment Station	do	4.50
	J. C. McCollough	do	20.30
	Bausch & Lomb Optical Co	Remounting lens	6.00
	J. M. Thorburn & Co	Seeds	4.50
	Library Bureau	Cards	19.00
	J. R. Towne	Seeds	2.50
21	J. Manz Engraving Co	Engraving	43.00
23	T. W. Wood & Sons	Seeds	9.25
	J. M. Thorburn & Co	do	32.00
	Henry Nungesser & Co	do	41.30
	J. J. H. Gregory & Son	do	19.49
	Chas. S. Brent & Bro	do	17.60
29	T. W. Wood & Sons	Teosinte	36.00
30	E. N. Wilcox et al	Salaries	510.75
	Total third quarter		3,573.05
Apr. 1	Jno. C. Parker	Manila paper	2.25
	H. L. Bentley	Salary	51.70
	Louis W. Carter	do	60.00
	B. C. Pittuck	do	25.80
	C. L. Shear	do	135.00
	The Western Rwy. of Alabama	Passenger transportation	11.25
	Southern Pacific Co	do	6.55
2	David Griffiths	Salary	51.70
3	J. M. Thorburn & Co	Seeds	12.00
	do	do	24.00
	do	do	5.75
4	E. J. Pullman	Photo mounts	4.86
12	Peter Henderson & Co	Seeds	40.00
	do	do	36.00
	J. M. Thorburn & Co	do	32.00
	T. W. Wood & Sons	do	60.00
	H. L. Bentley	Salary	46.60
16	Jas. Withycombe	do	15.00
	Fred. A. Schmidt	Blue-print paper	1.60
	F. H. Edmonds	Field glasses	63.00
	Herman Baumgarten	Rubber type holder	.65
	Mackall Bros	Corks and alcohol	1.55
17	Northrup, King & Co	Beans	17.50
19	J. M. Thorburn & Co	Seeds	26.50
20	Houghton & Delano	Photo supplies	13.54
	T. W. Wood & Sons	Seeds	15.00
	Blue Line Transfer Co	Transportation	4.13
22	Jas. K. Metcalfe	Seeds	66.25
	The Texas and Pacific Rwy. Co	Passenger transportation	3.75
	Southern Rwy. Co	do	27.50
	Sheetz & Bishop	Photographic supplies	27.75
	C. L. Shear	Traveling expenses	59.20
	H. L. Bentley	Seeds	67.50
23	Jno. A. Salzer Seed Co	do	.37
24	W. J. Spillman	Salary	150.00
	Henry A. Dreer, Inc	Seeds	25.20
25	A. B. Leckenby	Roots	30.00
26	C. L. Shear	Traveling expenses	62.50
27	Adams Express Co	Transportation	9.70
29	J. T. Willard	Grass roots	2.00
May 1	S. Ebbert	Seeds, etc	47.38
	P. Mann & Co	Bone meal	13.00
	E. J. Pullman	Photograph mounts	1.20
3	The Chesapeake and Potomac Telephone Co.	Telephone rent	6.25
8	Western Union Telegraph Co	Telegraph services	1.12
	do	do	4.80
16	Jas. B. Lambie	Hinges	1.28
24	United States Envelope Co	Envelopes	14.70
27	Yazoo and Mississippi Valley R. R. Co	Passenger transportation	5.40
	Mobile and Ohio R. R. Co	do	14.13
	International and Great Northern R. R. Co	do	8.65
	The Texas and Pacific Rwy. Co	do	13.60
	Chicago, Rock Island and Pacific Rwy. Co	do	4.21
	Grand Trunk Rwy. System	do	22.00
28	Western Union Telegraph Co	Telephone services	1.61
	do	do	3.94

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

GRASS AND FORAGE PLANT INVESTIGATIONS—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
May. 28	The J. C. Ergood Co	Salt	$0.15
June 1	Chas. W. Burkett	Salary	100.00
	B. C. Pittuck	do	25.60
	Lewis W. Carter	do	60.00
	H. L. Bentley	do	51.00
4	Baltimore and Ohio R. R. Co	Transportation	31.55
5	J. T. Willard	Traveling expenses	21.96
	W. J. Spillman	Services	150.00
21	Western Union Telegraph Co	do	1.12
25	Jas. K. Metcalfe	Seed	32.00
	Total fourth quarter		1,932.30
	Supplemental.		
July 1	B. C. Buffum	Salary	75.00
	C. W. Burkett	do	100.00
	H. L. Bentley	do	49.50
	B. C. Pittuck	do	24.70
	Louis W. Carter	do	60.00
	W. J. Spillman	do	150.00
	David Griffith	do	89.01
5	Adams Express Co	Transportation	2.57
11	Luther Foster	Salary	40.00
13	The Geo. W. Knox Express Co	Transportation	5.93
19	E. W. Hilgard	Traveling expenses	18.25
	United States Express Co	Transportation	.70
Aug. 6	F. H. Hillman	Manuscript on clover	252.50
9	Jos. B. Davy	Traveling expenses	37.85
21	The Chesapeake and Potomac Telephone Co.	Services	6.25
Sept. 10	Jos. B. Davy	Traveling expenses	33.70
21	A. B. Leckenby	Salary	150.00
Oct. 5	Chicago, Rock Island and Pacific Rwy. Co.	Passenger transportation	16.45
	Total		1,201.42

RECAPITULATION.

First quarter	$3,326.08
Second quarter	4,881.35
Third quarter	3,573.05
Fourth quarter	1,932.30
Supplemental	1,201.42
Total	14,914.20

IRRIGATION INVESTIGATIONS.

Date.	Name.	Nature of payment.	Total.
1900.			
July 31	Katherine A. Nau et al	Salaries	$227.85
Aug. 1	Elwood Mead et al	do	1,137.92
	Black & Clark	Short-gauge rods	11.60
6	E. T. Johnston	Salary	52.00
11	O. V. P. Stout	do	62.50
16	Clarence T. Johnston	Traveling expenses	20.65
	Elwood Mead	do	18.05
	R. P. Teele	do	13.25
20	A. G. Spalding & Bro	Wading pants	24.00
23	E. S. Nettleton	Traveling expenses	23.25
	J. C. Nagle	do	18.45
	do	Salary	110.00
	Elwood Mead	Traveling expenses	87.70
	do	Expenses	6.75
	do	Office expenses	20.85
	do	Photograph mounts, maps	11.50
	do	Desk and chairs	59.00
25	W. B. Moses & Sons	Traveling expenses	36.21
29	O. V. P. Stout	Carpenter work, etc	12.75
	A. McAdam	Typewriter paper	4.08
	D. Frank Parker	Cases and index	9.30
	Jno. C. Parker	Salaries	247.20
31	Katherine A. Nau et al	Traveling expenses	20.00
Sept. 4	W. M. Reed	Pay roll	1,227.12
5	Elwood Mead et al	Traveling expenses	87.70
	Clarence T. Johnston		

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

IRRIGATION INVESTIGATIONS—Continued.

Date.	Name.	Nature of payment.	Total.
1900.			
Sept. 5	E. L. Bristol	Typewriter paper	$10.00
	W. M. Reed	Salary	50.00
13	O. V. P. Stout	do	62.50
	E. T. Johnston	do	48.00
15	Frank Adams	do	200.00
17	Jay D. Stannard	Traveling expenses	104.55
18	Arthur P. Stover	do	69.40
	Wm. E. Smythe	Report	225.00
19	Elwood Mead	Expenses	8.60
	do	Traveling expenses	91.75
29	Katherine A. Nau et al	Salaries	298.86
	Total first quarter		4,718.29
Oct. 1	H. J. Waters	Salary	135.00
	J. C. Nagle	do	135.00
	do	Traveling expenses	28.60
	do	Expenses	14.40
	W. H. Code	Salary	50.00
2	Jay D. Stannard	Traveling expenses	40.00
	D. W. Ross	Expenses	33.00
	O. V. P. Stout	Traveling expenses	31.39
3	Elwood Mead	Expenses	18.67
	Elwood Mead et al	Salaries	1,212.03
	Hiram Sapp	Office rent	135.00
4	Rumsey & Co., Limited	Pump	35.00
5	Edwin S. Nettleton	Traveling expenses	24.75
12	Arthur P. Stover	do	76.75
	H. J. Waters	Salary	125.00
16	J. H. Arp	Wrapping paper	6.66
18	Frank Adams	Salary	100.00
19	The A. Leitz Co	Water register	60.00
20	S. P. Johnson	Typewriter, etc	98.75
	Jno. C. Parker	Sponge cups	5.16
26	Elwood Mead	Expenses	11.55
	A. P. Stover	Traveling expenses	73.52
	O. V. P. Stout	Salary	32.50
	do	Traveling expenses	14.85
30	E. Morrison Paper Co	Rubber bands	.51
31	Katherine A. Nau et al	Salaries	327.60
Nov. 2	D. W. Ross	Expenses	23.00
	do	do	23.00
	United States Envelope Co	Envelopes	12.64
3	W. M. Reed	Salary	30.00
5	Elwood Mead et al	Salaries	1,297.30
7	J. C. Nagle	Salary	65.00
9	J. D. Stannard	Traveling expenses	36.40
	do	do	48.80
14	Elwood Mead	Expenses	28.06
	do	do	9.94
	do	do	8.40
	J. M. Wilson	Traveling expenses	13.75
	do	Expenses	37.50
20	Fred A. Schmidt	Pencils, etc	7.28
21	W. H. Code	Salary	75.00
	W. M. Reed	do	50.00
	W. H. Code	Traveling expenses	75.00
	W. M. Reed	do	40.00
	do	Expenses	25.50
	Elwood Mead	Traveling expenses	20.90
	do	do	265.44
	A. F. Doremus	Salary	52.50
	H. J. Waters	do	135.00
	R. C. Gemmell	Expenses	53.20
	do	Traveling expenses	18.50
	Edw. M. Boggs	Making report	135.00
	Jas. H. Schuyler	do	750.00
22	Frank Adams	Expenses	5.25
	J. C. Nagle	do	19.75
	do	do	11.25
	Elwood Mead	do	18.65
	Samuel Fortier	Salary, July	120.00
	do	Salary, August	115.00
	do	Salary, September	115.00
	do	Salary, October	125.00
23	A. D. Farmer & Son Type Foundry Co	Type	19.82
30	Katharine A. Nau et al	Salaries	344.80
Dec. 6	Elwood Mead et al	do	1,303.77
	W. H. Code	Salary	50.00
	H. J. Waters	do	105.00

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

IRRIGATION INVESTIGATIONS—Continued.

Date.	Name.	Nature of payment.	Total.
1900.			
Dec. 8	Geo. L. Swendsen	Report on water in Utah	$200.00
14	Frank Adams	Traveling expenses	14.20
	E. S. Nettleton	do	5.50
	W. M. Reed	do	2.00
	Elwood Mead	Expenses	22.50
	do	Traveling expenses	71.80
	C. T. Johnston	do	61.75
	B. H. Sage	Making stand	16.00
	C. E. Grunsky	Report on Kings River Valley	375.00
	Jas. D. Schuyler	Report	50.00
17	F. A. Schmidt	Drawing materials	12.20
	Rudolph, West & Co	Shears	2.32
19	Elwood Mead	Expenses	18.36
21	D. W. Ross	Salary	300.00
29	F. E. Warren Mercantile Co	Matting	13.00
	do	Desks and chairs	54.00
	S. P. Johnson	Typewriter	57.50
	O. V. P. Stout	Traveling expenses	17.34
	Frank Adams	do	31.15
31	Katharine A. Nau et al	Salaries	448.40
	Total second quarter		10,289.11
1901.			
Jan. 2	Santa Fe, Prescott and Phoenix Ry. Co	Passenger transportation	11.80
	Union Pacific R. R. Co	do	36.00
3	W. M. Reed	Salary	120.00
	Elwood Mead et al	Salaries	1,445.55
	Marshall, Westcoat & Co	Nails	7.35
	Wm. M. Bird & Co	Oil	17.00
4	W. M. Reed	Expenses	40.80
5	A. McAdam	Shelving	14.50
	J. M. Wilson	Traveling expenses	60.80
7	R. Carter Ballantyne	Manila paper	3.35
15	F. H. King	Salary	200.00
18	D. Frank Parker	Typewriter ribbon	12.60
	Jno. C. Parker	Typewriter desk	23.75
23	O. L. Waller	Services	25.00
	Hiram Sapp	Rent rooms	135.00
24	do	do	24.50
	W. H. Code,	Report	115.00
25	J. M. Wilson	Traveling expenses	25.15
	do	Expenses	58.55
	V. A. Clark	Traveling expenses	22.25
28	R. C. Gemmel	Salary	200.00
	J. C. Nagle	Expenses	7.50
	Elwood Mead	do	10.89
	do	do	9.75
29	W. B. Moses & Sons	Chair	5.00
30	Black & Clark	Constructing station	50.00
	Julien P. Freiz	Water register	125.00
31	W. H. Beal et al	Salaries	836.37
Feb. 1	W. H. Code	Expenses	110.00
2	Jno. C. Parker	Rulers, etc	27.22
5	F. H. King	Salary	100.00
	R. C. Gemmeli	Expenses	68.30
	Elwood Mead et al	Salaries	1,526.90
	Elwood Mead	Expenses	.65
		Traveling expenses	135.90
6	do	do	74.30
	C. T. Johnston	Salary	75.00
7	W. H. Code	Expenses	18.40
8	Chas. U. Shepard	do	11.61
	C. T. Johnston	do	20.00
	do	do	8.70
	do	do	25.70
12	O. L. Waller	Traveling expenses	150.00
	The Norris Peters Co	Maps	19.79
13	The Maurice Joyce Engraving Co	Engraving	3.34
14	R. Carter Ballantyne	Pens	77.55
20	C. T. Johnston	Traveling expenses	35.70
	Chas. U. Shepard	Expenses	46.94
21	The Bailey-Libby Co	Tank	43.98
	do	Pipe, etc	22.76
	do	Rope, etc	36.00
23	Elwood Mead	Traveling expenses	14.74
26	The Hocking Valley Manufacturing Co	Repairs, etc	8.00
	Jno. C. Parker	Typewriter paper	3.50
27	Geo. F. Muth & Co	Ink	9.10
	Adams Express Co	Transportation	771.34
28	W. H. Beal et al	Salaries	

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

IRRIGATION INVESTIGATIONS—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
Mar. 2	Fred A. Schmidt	Drawing materials	$10.80
9	Elwood Mead et al	Salaries	1,386.20
11	Jno. F. Riley	Windlass	40.00
	F. H. King	Salary	100.00
	Southeastern Lime and Cement Co	Cement	46.00
	Jno. A. Widtsoe	Traveling expenses	47.25
	C. T. Johnston	Expenses	9.85
	do	do	5.00
	R. Q. Tenney	Article for publication	15.00
13	Fred A. Schmidt	Pencils	6.00
18	The Arp & Hammond Hardware Co	Hardware	14.00
	The S. A. Bristol Co	Bulletin paper	18.60
	E. J. Wikson	Article for publication	282.00
20	Southeastern Lime and Cement Co	Cement	23.00
	O. C. Sires & Bro	Cement, etc	90.00
	W. H. Code	Salary	50.00
	O. V. P. Stout	Expenses	23.40
	J. C. Nagle	Salary	50.00
	do	Traveling expenses	7.70
	do	Expenses	13.15
	E. S. Nettleton	Traveling expenses	13.95
21	C. T. Johnston	Expenses	7.96
	The Denver Novelty Works and Electric Co.	Electric supplies	7.70
	O. L. Waller	Services	125.00
22	Frank Bond	Traveling expenses	140.30
25	E. S. Nettleton	do	7.00
30	W. H. Beal et al	Salaries	759.10
	Total third quarter		10,387.84
Apr. 1	The Chesapeake and Ohio Ry. Co	Passenger transportation	44.00
	Union Pacific R. R. Co	do	18.00
2	Hiram Sapp	Rent of rooms	45.00
	do	do	135.00
	Chas. U. Shepard	Expenses	49.20
	Elwood Mead et al	Salaries	1,526.90
	H. G. Hay	Safe	50.00
	A. A. Wagner	Rain gauge	17.40
6	Jno. C. Parker	Bristol board	14.40
8	C. T. Johnston	Expenses	28.50
	do	do	23.78
12	F. H. King	Salary	100.00
16	J. Manz Engraving Co	Engraving	20.00
	C. W. Beach	Report	100.00
	A. S. Aloe Co	Track and car for blue print frame.	18.36
	J. C. Nagle	Traveling expenses	7.85
	Elwood Mead	do	61.85
	O. L. Waller	Expenses	14.50
	O. V. P. Stout	do	6.61
	Fred A. Schmidt	Pencils and paints	2.50
	Rudolph, West & Co	Steel tapes	19.50
17	J. C. Nagle	Expenses	12.75
18	J. M. Wilson	Traveling expenses	39.85
	do	do	13.35
	C. T. Johnston	do	92.35
22	Baltimore and Ohio R. R. Co	Passenger transportation	14.00
23	The App. Engraving Co	Making plates	32.00
24	Saml. Fortier	Salary	75.00
	do	do	75.00
	W. H. Code	Traveling expenses	39.00
	Geo. L. Swendsen	Preparing report	100.00
25	O. V. P. Stout	Traveling expenses	6.50
30	C. E. Johnston et al	Salaries	684.20
May 1	Modern Machine and Model Works	Water registers	150.00
	J. E. Turton	Supports for rain gauges	6.84
2	Elwood Mead et al	Salaries	1,435.48
	W. H. Code	Salary	25.00
3	E. F. Ladd	Traveling expenses	40.76
	J. H. Arp	Repairs to register, etc	15.50
	W. Irving	Report	100.00
	Julien P. Freiz	Pens for water register	7.50
6	J. M. Wilson	Expenses	12.50
	do	Traveling expenses	22.90
	Modern Machine and Model Works	Water register	30.00
	Julien P. Freiz	Copper band, etc	40.75
8	Western Union Telegraph Co	Services	4.65
13	Wagner Bros. & Co	Register sheets	2.25

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

IRRIGATION INVESTIGATIONS—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
May 24	Chas. U. Shepard	Expenses	$9.90
	J. C. Nagle	do	10.25
	do	Salary	30.00
	Clarence T. Johnston	Expenses	22.61
	do	do	40.46
	F. H. King	Salary	100.00
	Black & Clark	Making table, etc	7.00
	A. Lietz Co	Water registers	201.70
	W. H. Code	Salary	25.00
	Jay D. Stannard	Traveling expenses	39.25
	W. M. Reed	Salary	30.00
	Elwood Mead	Traveling expenses	33.85
	United States Envelope Co	Envelopes	9.34
	Library Bureau	Cards	4.50
31	W. H. Beal et al	Salaries	728.00
June 3	Elwood Mead et al	do	1,281.40
	F. H. King	Salary	100.00
	The Steiner Cardwell Art Co	Paper	4.25
	J. M. Wilson	Traveling expenses	33.35
5	C. T. Johnston	do	133.15
6	A. E. Chandler	Salary	95.00
11	W. M. Reed	Expenses	17.75
	do	Traveling expenses	6.50
	J. M. Wilson	Expenses	34.40
	C. T. Johnston	do	35.33
	do	do	10.99
	do	do	5.20
	A. Hoen & Co	Lithographic plates	810.00
14	C. T. Johnston	Traveling expenses	104.15
	Frank Adams	do	15.25
	H. C. Bradley	do	66.55
	O. V. P. Stout	Salary	30.00
	do	Expenses	4.45
	J. C. Nagle	Traveling expenses	12.15
	do	Expenses	21.25
21	W. M. Reed	Traveling expenses	12.40
	do	Expenses	26.48
	Siegel, Cooper & Co	Bells	5.70
	A. S. Carter	Batteries	6.00
	W. & L. E. Gurley	Insulators	2.40
	Western Union Telegraph Co	Service	11.95
	J. C. Nagle	Salary	35.00
24	O. V. P. Stout	Traveling expenses	19.50
	Arthur P. Stover	do	192.30
25	Elwood Mead	do	10.40
	Denver and Rio Grande R. R. Co	Passenger transportation	18.00
29	W. H. Beal et al	Salary	738.60
	Total fourth quarter		10,573.19
	Supplemental.		
July 5	Hiram Sapp	Office rent	45.00
	do	do	135.00
	Saml. Fortier	Salary	290.00
	W. H. Code	do	35.00
	Elwood Mead et al	Salaries	1,424.20
	Adams Express Co	Transportation	2.32
	do	do	3.07
9	Union Pacific R. R. Co	do	4.30
12	J. D. Stannard	Traveling expenses	116.10
	Frank Adams	do	22.20
13	W. M. Reed	Salary	70.00
17	J. C. Nagle	do	135.00
	Jos. Mack	do	45.00
	E. G. Johnston	do	52.00
	do	do	54.00
	do	do	50.00
	Geo. H. Keeney	do	130.00
	do	do	95.00
19	United States Express Co	Transportation	2.50
20	O. V. P. Stout	Salary	125.00
	do	do	45.00
	F. H. King	do	100.00
	A. E. Chandler	do	125.00
23	C. T. Johnston	Expenses	6.55
	D. W. Ross	do	29.50
24	W. M. Reed	do	35.45
	Frank Bond	Traveling expenses	79.40

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

IRRIGATION INVESTIGATIONS—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
July 24	C. T. Johnston	Expenses	$38.69
	A. E. Chandler	do	61.46
	J. C. Nagle	do	20.50
	W. M. Reed	Salary	130.00
	do	do	170.00
26	O. V. P. Stout	Expenses	26.50
	A. E. Chandler	do	117.00
27	J. M. Wilson	Traveling expenses	42.16
	do	do	52.30
	D. W. Ross	Expenses	45.00
	do	do	24.00
	do	Salary	200.00
29	W. H. Code	Traveling expenses	61.00
	Jay. D. Stannard	do	23.00
	J. C. Nagle	do	15.55
	J. M. Wilson	Expenses	16.00
	W. H. Code	Salary	35.00
	M. A. Seed Dry Plate Co	Plates	14.32
	The Denver Fire Clay Co	Plate holder	4.80
	W. H. Code	Salary	130.00
30	Arthur P. Stover	Traveling expenses	131.95
	The Modern Machine Works Co	Pens for water register	10.00
	Jno. C. Parker	Typewriter desk	23.50
Aug. 1	Fred A. Schmidt	Section liner, etc	22.18
	R. L. Lamb	Numbering machine	11.20
	Harry C. Bradley	Services	13.74
2	C. T. Johnston	Expenses	35.25
	McIntosh Stereopticon Co	Stereopticon	44.80
	do	Condenser, etc	4.40
	Denver Fire Clay Co	Materials for slides	9.05
	G. Cramer Dry Plate Co	Slides	12.37
	Texas and New Orleans R. R. Co	Passenger transportation	11.70
	The Colorado and Southern Rwy. Co	do	57.30
3	E. S. Nettleton (deceased)	Traveling expenses	103.60
	The Modern Machine and Model Works	Water registers	150.00
	O. L. Waller	Salary	20.00
9	Geo. H. Keeney	Traveling expenses	122.62
	E. B. Voorhees	do	2.50
	W. M. Reed	do	1.90
	H. C. Bradley	do	23.06
	O. L. Waller	do	75.45
12	Jno. C. Parker	Pasteboard tubes	12.00
16	R. P. Teele	Traveling expenses	18.25
	O. V. P. Stout	do	20.50
	C. T. Johnston	do	74.95
	O. L. Waller	Salary	30.00
17	Houghton & Delano	Camera, etc	56.35
20	Samuel Fortier	Services	205.00
21	Wagner Bros. & Co	Register sheets	2.25
22	Samuel Fortier	Traveling expenses	65.15
	E. B. Voorhees	Expenses	97.50
	O. L. Waller	do	1.05
	do	do	23.45
	McIntosh Stereopticon Co	Slide boxes	6.00
28	Frank Bond	Traveling expenses	4.94
	The Denver Fire Clay Co	Chemicals	10.05
29	P. N. Ashley	Services	148.75
Sept. 4	W. & L. E. Gurley	Meters	140.00
	do	do	140.00
5	Elwood Mead	Traveling expenses	6.19
Oct. 2	W. & L. E. Gurley	Apparatus	115.00
5	Union Pacific R. R. Co	Passenger transportation	44.75
10	Library Bureau	Cases	22.00
12	Postal Telegraph Cable Co	Service	168.00
	Total		6,614.25

RECAPITULATION.

First quarter	$4,718.49
Second quarter	10,289.11
Third quarter	10,387.84
Fourth quarter	10,573.19
Supplemental	6,614.25
Total	42,582.88

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

EXPERIMENT STATIONS.

Date.	Name.	Nature of payment.	Total.
1900.			
July 31	A. C. True et al	Salaries	$2,393.75
Aug. 1	Saml. H. Moore	Portfolio	5.75
10	Houghton & Delano	Seed plates	4.09
13	W. H. Evans	Traveling expenses	48.12
29	M. Du Perow	Fan	12.90
	D. Frank Parker	Typewriter ribbons	3.75
31	A. C. True et al	Salaries	2,374.40
Sept. 5	Wyckoff, Seamans & Benedict	Repairing typewriter	13.10
10	A. C. True	Traveling expenses	101.18
19	E. L. Henry	Preparing index	200.00
20	A. C. True	Traveling expenses	39.03
	do	do	23.23
21	New York Central and Hudson River R. R. Co.	Passenger transportation	18.50
	Maine Central R. R. Co	do	11.00
22	E. W. Allen	Traveling expenses	108.60
29	A. C. True et al	Salaries	2,313.39
	Total first quarter		7,670.79
Oct. 5	Pennsylvania R. R. Co	Passenger transportation	8.11
	New York Central and Hudson River R. R. Co.	do	4.00
10	D. Frank Parker	Mimeograph paper, etc	6.30
12	A. C. True	Traveling expenses	66.05
20	Jno. C. Parker	Binding cases, etc	12.75
24	The Delaware and Hudson Co	Passenger transportation	4.05
	Boston and Albany R. R. Co	do	2.34
	Pennsylvania R. R. Co	do	6.58
	The Lake Shore and Michigan Southern Rwy. Co.	do	5.00
	Pennsylvania Co	do	8.50
31	A. C. True et al	Salaries	2,469.40
Nov. 2	The Chesapeake and Potomac Telephone Co.	Telephone rent	6.25
8	A. C. True	Traveling expenses	80.14
17	Library Bureau	Cards	20.00
21	A. C. True	Traveling expenses	36.95
23	S. N. Meyer	Labels	7.75
24	Pennsylvania R. R. Co	Passenger transportation	17.00
30	A. C. True et al	Salaries	2,487.80
Dec. 3	Wyckoff, Seamans & Benedict	Repairs to typewriter	27.45
	Peter Fireman	Translating	83.75
	E. Morrison Paper Co	Linen paper	18.00
5	Great Northern Rwy. Co	Passenger transportation	6.98
	W. B. Moses & Sons	Desks, etc	34.84
	Northern Pacific Rwy. Co	Passenger transportation	49.45
	New York Central and Hudson River R. R. Co.	do	3.66
	Pennsylvania Co	do	7.00
	Chicago, Milwaukee and St. Paul Rwy. Co.	do	3.92
	Chicago and Norwestern Rwy. Co	do	8.10
	Burlington and Missouri River R. R. in Nebraska.	do	3.30
11	S. P. Johnson	Repairing typewriter	8.15
14	E. L. Henry	General index	300.00
19	E. W. Allen	Traveling expenses	41.76
20	Baltimore and Ohio R. R. Co	Passenger transportation	12.32
31	A. C. True et al	Salary	2,596.53
	Total second quarter		8,454.18
1901.			
Jan. 2	Pittsburg, Cincinnati, Chicago and St. Louis Rwy. Co	Passenger transportation	18.05
	Chicago and Northwestern Rwy. Co	do	9.80
	Union Pacific R. R. Co	do	18.75
	Illinois Central R. R. Co	do	3.83
	Lehigh Valley R. R. Co	do	3.30
	Pennsylvania R. R. Co	do	10.00
3	Reading Paper Mills	Paper	18.00
7	United States Express Co	Transportation	2.56
14	Mackall Bros	Alcohol	.65
16	The Geo. W. Knox Express Co	Transportation	.70
18	Jno. C. Parker	Stationery supplies	7.26
19	Adams Bros	Elbows	5.00
	Peter Fireman	Translating	35.00
	Chas. F. Roberts	Reporting proceedings of convention.	78.60
	Yawman & Erbe Manufacturing Co	Cabinet	11.00

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

EXPERIMENT STATIONS—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
Jan. 21	United States Envelope Co	Envelopes	$22.03
	Library Bureau	Index cards	3.25
22	W. B. Moses & Sons	Carpet sweeper and table	8.25
26	Wyckoff, Seamans & Benedict	Repairs to typewriter	2.30
28	Geo. A. Harlow	Traveling expenses	1.85
31	A. C. True et al	Salaries	2,503.61
Feb. 1	United States Envelope Co	Envelopes	46.70
6	The Oregon R. R. and Navigation Co	Passenger transportation	55.85
	Burlington, Cedar Rapids and Northern Rwy. Co.	do	7.03
	The Cleveland, Cincinnati, Chicago and St. Louis Rwy. Co.	do	1.90
	The Wabash R. R. Co	do	2.39
	New York, New Haven and Hartford R. R. Co.	do	3.00
	Baltimore and Ohio R. R. Co	do	2.88
11	M. Du Perow	Electric supplies	16.00
12	Peter Fireman	Translating	20.00
	W. B. Moses & Sons	Desk	24.50
	The Chesapeake and Potomac Telephone Co.	Telephone rent	6.25
18	S. P. Johnson	Typewriter cover	2.25
21	D. Frank Parker	Mimeograph paper	3.50
	Jno. C. Parker	Knives for pencil pointer	.65
23	Library Bureau	Index cards	4.25
26	The Hammond Typewriter Co	Impression stripes	.30
	Rudolph, West & Co	Thumb bolts	.45
27	Adams Express Co	Transportation	.65
28	A. C. True et al	Salaries	2,230.40
Mar. 1	W. B. Moses & Sons	Chair	5.00
5	F. W. Woll	Translating	85.00
12	E. L. Henry	Repairing index	300.00
14	R. Carter Ballantyne	Calendar	.55
20	H. L. Russell	Article for publication	25.00
23	United States Envelope Co	Envelopes	18.48
30	A. E. True et al	Salaries	2,464.80
	Total third quarter		8,091.57
Apr. 3	A. C. True	Traveling expenses	49.90
	Library Bureau	Boxes and cards	8.90
10	Jno. C. Parker	Tag board	9.50
16	Fred. A. Schmidt	Sponge rubber	.50
	W. H. Veerhoff	Picture mats	.60
	Mackall Bros	Alcohol	.65
20	Southern Pacific Co	Passenger transportation	7.72
23	Pennsylvania R. R. Co	do	15.85
27	United States Express Co	Transportation	.25
	Adams Express Co	do	4.06
30	A. C. True et al	Salaries	2,409.95
May 3	The Chesapeake and Potomac Telephone Co	Rent	6.25
4	Wyckoff, Seamans & Benedict	Roller	1.50
8	Western Union Telegraph Co	Services	1.48
	do	do	5.10
27	Savannah, Florida and Western Rwy. Co	Passenger transportation	16.50
	Southern Rwy. Co	do	19.89
28	W. H. Beal	Traveling expenses	171.00
	A. C. True	do	81.86
31	A. C. True et al	Salaries	2,384.44
June 4	Seaboard Air Line Rwy. Co	Passenger transportation	4.80
11	M. Du Perow	Tube whistles	.50
14	Ernestine Fireman	Translating	55.00
15	E. L. Henry	Preparing index	100.00
21	Library Bureau	Cards	1.60
	Western Union Telegraph Co	Service	4.68
24	Eberhard Faber	Bands	4.20
25	The Atchison, Topeka and Santa Fe Rwy	Passenger transportation	38.40
	Oregon Short Line R. R. Co	do	6.10
28	A. C. True	Traveling expenses	29.40
29	A. C. True et al	Salaries	2,192.72
	Total fourth quarter		7,633.30
	Supplemental.		
July 5	B. Tollens	Article for publication	100.00
16	A. C. True	Traveling expenses	10.20
17	Sheetz & Bishop	Films, etc	3.20
	E. Fireman	Translating	45.00
20	F. H. Lovell & Co	Clock	7.25

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

EXPERIMENT STATIONS—Continued.

Date.	Name.	Nature of payment.	Total.
	Supplemental.		
1901.			
July 20	H. J. Green	Thermometer	$1.25
26	Southern Pacific Co	Transportation	13.70
	Baltimore and Ohio R. R. Co	Passenger transportation	37.20
	Union Pacific R. R. Co	do	19.85
	Louisville and Nashville R. R. Co	do	9.59
	The Atchison, Topeka and Santa Fe Rwy. Co	do	8.05
29	Hattie M. Pieters	Translating	87.50
	Chas. Grose	Cane seat for chair	1.00
	Wm. H. Rupp	Postal scale	2.70
30	Houghton & Delano	Seed plates, etc	7.88
31	F. W. Woll	Translating	40.00
Aug. 1	Jno. C. Parker	Stamp racks, etc	39.60
2	E. Morrison Paper Co	Ledger cards	3.15
	Texas and New Orleans R. R. Co	Passenger transportation	10.85
	The Rio Grande Western Rwy. Co	do	18.00
	Illinois Central R. R. Co	do	8.75
	The Colorado and Southern Rwy. Co	do	2.75
	Pennsylvania R. R. Co	do	8.30
	The Wabash R. R. Co	do	24.60
	Yazoo and Mississippi Valley R. R. Co	do	2.70
	Southern Rwy. Co	do	20.98
6	W. B. Moses & Sons	Linoleum	191.90
12	Rudolph, West & Co	Drawer pulls	.64
	The Geo. W. Knox Express Co	Transportation	2.50
19	M. Du Perow	Telephones	120.00
21	The Chesapeake and Potomac Telephone Co	Services	6.25
22	Chas. R. Edmonston	Cooler	3.80
Sept. 12	E. W. Allen	Traveling expenses	67.60
Oct. 5	Union Pacific R. R. Co	Passenger transportation	14.65
	Chicago, Rock Island and Pacific Rwy. Co	do	8.70
	Chicago and Northwestern Rwy. Co	do	14.74
	Fremont, Elkhorn and Missouri Valley Rwy. Co.	do	1.57
	Southern Rwy. Co	do	8.75
	Total		975.15

RECAPITULATION.

First quarter	$7,670.79
Second quarter	8,454.18
Third quarter	8,091.57
Fourth quarter	7,633.30
Supplemental	975.15
Total	32,824.99

RESOURCES OF ALASKA.

[Appropriation for 1900–1901.]

Date.	Name.	Nature of payment.	Total.
1900.			
June 9	C. C. Georgeson	Salary	$57.69
21	Allen & Nelson Mill Co	Lumber	97.39
	Total fourth quarter, 1900		155.08
July 7	Schwabacher Hardware Co	Hardware, etc	39.13
	R. T. Shannon	Provisions	76.55
	Seattle Hardware Co	Blocks, etc	33.67
	Frederick, Nelson & Munro	Shades	15.05
	The Vulcan Iron Works Co	Smokestack	36.60
	F. W. Baker	Blocks, rope, etc	28.67
	Fred. E. Rader	Salary	74.20
	H. P. Nielsen	do	150.00
	C. C. Georgeson	do	247.25
21	Fred. E. Rader	Expenses	217.50
Aug. 3	H. P. Nielsen	Salary	150.00
	Fred. E. Rader	do	117.90
	Isaac Jones	do	117.90
	do	do	98.90
11	H. P. Nielsen	Expenses	33.30

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

RESOURCES OF ALASKA—Continued.

Date.	Name.	Nature of payment.	Total.
1900.			
Aug. 14	M. G. Copeland & Co	United States flag	$3.45
23	Fred. E. Rader	Office expenses	136.20
29	Chas. Fickz	Alder wood	20.00
Sept. 5	H. P. Nielsen	Salary	101.10
	Isaac Jones	do	117.90
	Fred. E. Rader	do	117.90
8	C. C. Georgeson	do	589.60
	Total first quarter, 1901		2,522.17
Oct. 4	C. C. Georgeson	Salary	285.40
	Fred. E. Rader	do	73.40
	H. P. Nielsen	do	97.80
	Isaac Jones	do	97.80
5	Pacific and Arctic Rwy. and Navigation Co.	Passenger transportation	120.00
	do	do	20.00
16	Isaac Jones	Services	23.08
24	Alaska Steamship Co	Passenger transportation	6.00
	Pacific Coast Steamship Co	do	25.00
	Alaska Commercial Co	do	40.00
	North American Transportation and Trading Co.	do	10.00
	Alaska Steamship Co	do	25.00
Nov. 20	W. P. Mills	Lumber	16.14
22	Isaac Jones	Traveling expenses	15.00
28	C. C. Georgeson	do	205.40
Dec. 3	W. P. Mills	Paint, etc	36.95
20	Alaska Commercial Co	Passenger transportation	10.00
	Pacific Steam Whaling Co	Transportation	86.00
29	Seattle Hardware Co	Hardware	14.50
	Total second quarter		1,207.47
1901.			
Jan. 3	Isaac Jones	Traveling expenses	3.60
Mar. 23	C. C. Georgeson	Expenses	18.25
	Total third quarter		21.85
Apr. 20	Pacific Coast Steamship Co	Transportation	21.29
May 27	do	do	12.95
	Total fourth quarter		34.24

RECAPITULATION.

Fourth quarter, 1900	$155.08
First quarter, 1901	2,522.17
Second quarter, 1901	1,207.47
Third quarter, 1901	21.85
Fourth quarter, 1901	34.24
Total	3,940.81

RESOURCES OF ALASKA.

Date.	Name.	Nature of payment.	Total.
1900.			
Sept. 22	F. E. Rader	Expenses	$86.50
	Total first quarter		86.50
Oct. 2	Holden & Wilson Furniture Co	Rugs, etc	61.00
	Edw. de Groff	Coal	44.00
	Standard Furniture Co	Table and stand	25.50
Nov. 3	C. C. Georgeson	Salary	294.80
	Isaac Jones	do	101.10
	H. P. Nielsen	do	101.10
	Fred. E. Rader	do	75.80
14	W. P. Mills	Tools, etc	47.45
21	C. D. Shaw	Wood	47.50
Dec. 6	C. C. Georgeson	Salary	285.40
	Fred. E. Rader	do	73.40
	H. P. Nielsen	do	97.80
	Isaac Jones	do	97.80
29	H P. Nielsen	Expenses	138.75

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

RESOURCES OF ALASKA—Continued.

Date.	Name.	Nature of payment.	Total.
1900.			
Dec. 29	Rohlf & Schoder	Lumber	$17.00
	Frederick, Nelson & Munro	Furniture	40.50
	Total second quarter		1,548.90
1901.			
Jan. 3	Fred. E. Rader	Salary	$75.80
	Isaac Jones	do	101.10
	C. C. Georgeson	do	252.70
24	Seattle Hardware Co	Hardware	4.65
Feb. 2	Edwd. de Groff	Ironwork tools	47.94
	The A. Humbach Co	Enamel tub, etc	107.50
	W. P. Mills	Hardware, etc	69.17
	Edw. de Groff	Sulphur	3.00
5	C. C. Georgeson	Salary	258.30
	do	Traveling expenses	11.90
	W. P. Mills	Shelving	58.95
	Isaac Jones	Salary	103.30
	Fred. E. Rader	do	77.50
6	Pacific Coast Steamship Co	Passenger transportation	60.00
Mar. 1	Isaac Jones	Salary	93.40
	Fred. E. Rader	do	70.00
	C. C. Georgeson	do	233.40
20	Tom Tilsen	Wood	10.00
	Jno. W. Dudley	Lime	7.00
30	C. C. Georgeson	Salary	258.30
	Fred. E. Rader	do	77.50
	Isaac Jones	do	103.30
	H. P. Neilsen	do	401.10
	Total third quarter		2,485.81
Apr. 4	The Alaska Publishing Co	Circular letter	6.38
	Ruben Albertstone	Rent, land	18.00
20	E. J. Pullman	Photo supplies	10.80
	Pacific Coast Steamship Co	Transportation	29.40
27	United States Express Co	do	8.80
30	Isaac Jones	Salary	98.90
	H. P. Nielsen	do	98.90
	Fred. E. Rader	do	98.90
	C. C. Georgeson	do	247.25
May 3	Edwd. De Groff	Coal oil, etc	14.55
	Carl Spuhn	Fish guano	29.80
6	W. P. Mills	Feed, repairs, etc	109.71
	do	Lumber	12.35
8	Henry J. Green	Thermometers	37.50
	Western Union Telegraph Co	Telegraph service	1.00
June 1	Isaac Jones	Salary	102.20
	H. B. Nielsen	do	102.20
	F. E. Rader	do	102.20
	C. C. Georgeson	do	255.50
3	Lilly Bogardus & Co	Peas, oats, and alfalfa	43.00
	H. P. Nielsen	Expenses	65.70
	Allen Lund	Herbarium	9.00
29	Isaac Jones	Salary	98.90
	Fred. E. Rader	do	98.90
	H. P. Nielsen	do	98.90
	Total fourth quarter		1,798.74
	Supplemental.		
July 25	H. P. Nielsen	Expenses	11.00
	do	do	34.45
30	C. N. Sandahl	Plants	2.50
Aug. 1	Jno. C. Parker	Tags	5.25
6	C. C. Georgeson	Expenses	18.95
9	E. De Groff	Coil oil and ink	6.40
	Total		78.55

RECAPITULATION.

First quarter	$86.50
Second quarter	1,548.90
Third quarter	2,485.81
Fourth quarter	1,798.74
Supplemental	78.55
Total	5,998.50

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

AGRICULTURAL RESOURCES OF HAWAII.

[Appropriation for 1900–1901.]

Date.	Name.	Nature of payment.	Total.
1900.			
Oct. 5	Oceanic Steamship Co	Passenger transportation	$75.00
16	W. C. Stubbs	Services	1,050.00
24	Richmond, Fredericksburg and Potomac R. R. Co.	Passenger transportation	3.50
	Southern Rwy. Co	do	23.00
Nov. 24	Pennsylvania R. R. Co	do	3.50
Dec. 25	Baltimore and Ohio R. R. Co	do	20.25
	Total second quarter		1,175.25
1901.			
Jan. 5	W. C. Stubbs	Traveling expenses	189.80
Mar. 16	Jared G. Smith	Salary	125.00
30	do	do	133.33
	Total third quarter		448.13
Apr. 1	Jno. C. Parker	Cardboard	2.25
30	Jared G. Smith	Salary	247.25
May 8	Western Union Telegraph Co	Telegraph service	1.86
27	Oceanic Steamship Co	Passenger transportation	85.00
June 18	W. B. Moses & Sons	Rugs	12.33
21	Western Union Telegraph Co	Telegraph service	.94
	Total fourth quarter		349.63
	Supplemental.		
July 19	J. G. Smith	Salary	255.50
Aug. 1	Jno. C. Parker	Press copy sheets	7.62
	Total		263.12

RECAPITULATION.

Second quarter	$1,175.25
Third quarter	448.13
Fourth quarter	349.63
Supplemental	263.12
Total	2,236.13

AGRICULTURAL RESOURCES OF PORTO RICO.

[Appropriation for 1900–1901.]

Date.	Name.	Nature of payment.	Total.
1900.			
July 12	Seaman A. Knapp	Salary	$200.00
Aug. 3	do	do	200.00
Sept. 5	do	do	200.00
	Total first quarter		600.00
Oct. 9	Seaman A. Knapp	Salary	200.00
16	do	Traveling expenses	382.79
	do	Expenses	15.00
Nov. 28	do	do	123.33
	Total second quarter		721.12
1901.			
Apr. 30	F. D. Gardner	Salary	123.63
May 4	S. P. Johnson	Typewriter	60.00
13	Jno. S. Topham	Steamer trunk	6.50
16	Jno. C. Parker	Copyholders	3.50
	D. Frank Parker	Typewriter stand	4.00
21	Sheetz & Bishop	Kodak, etc	29.40
	G. W. Moss	Passenger transportation	50.00
24	Bausch & Lomb Optical Co	Services	13.50
28	R. P. Clarke Co	Towels	3.40
31	F. D. Gardner et al	Salaries	334.62
June 3	Brentanos	Books	21.75
13	Frank D. Gardner	Traveling expenses	67.27

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

AGRICULTURAL RESOURCES OF PORTO RICO—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
June 14	Bausch & Lomb Optical Co	Microscope	$75.90
15	R. Carter Ballantyne	Labels	1.72
25	New York and Porto Rico Steamship Co	Passenger transportation	180.00
29	Walter H. Evans et al	Salaries	148.30
	Total fourth quarter		1,123.49
	Supplemental.		
July 1	Frank D. Gardner	Salary	247.25
30	Brentanos	Cyclopedia of horticulture	16.30
Aug. 1	Jno. C. Parker	Copying press	10.50
10	Chas. R. Edmonston	Cooler and stand	5.80
12	The Geo. W. Knox Express Co	Transportation	1.10
21	Yawman & Erbe Manufacturing Co	Files	2.70
Oct. 5	Baltimore and Ohio R. R. Co	Passenger transportation	6.50
	Total		290.15

RECAPITULATION.

First quarter	$600.00
Second quarter	721.12
Fourth quarter	1,123.49
Supplemental	290.15
Total	2,734.76

NUTRITION INVESTIGATIONS.

Date.	Name.	Nature of payment.	Total.
1900.			
July 25	Mary H. Abel	Article for publication	$150.00
31	C. F. Langworthy	Salary	151.60
Aug. 3	W. O. Atwater et al	Salaries	1,301.90
	Chas. D. Woods	Salary	84.20
29	Isabel Bevier	Dietary study	100.00
31	C. F. Langworthy	Salary	151.60
Sept. 4	W. O. Atwater et al	Salaries	913.14
	Chas. D. Woods	Salary	84.20
6	Russell A. Frisbie	Bicycle	28.00
22	C. F. Langworthy	Traveling expenses	13.00
29	do	Salary	146.80
	Total first quarter		3,124.44
Oct. 5	W. O. Atwater et al	Salaries	778.66
	Chas. D. Woods	Salary	81.10
23	S. C. Dinsmore	Alterations in calorimeter	42.00
31	C. F. Langworthy	Salary	151.60
Nov. 3	Chas. D. Woods	do	84.20
5	W. O. Atwater	Traveling expenses	50.00
	do	Expenses	2.05
	W. O. Atwater et al	Salaries	788.60
12	S. C. Dinsmore	Services	59.50
30	C. F. Langworthy	Salary	146.80
Dec. 3	L. A. Voorhes	Report on bread experiments	250.00
6	Chas. D. Wood	Salary	81.60
	W. O. Atwater et al	Salaries	913.60
31	A. P. Bryant	Traveling expenses	16.55
	C. F. Langworthy	Salary	151.60
	Total second quarter		3,598.35
1901.			
Jan. 5	W. O. Atwater	Expenses	107.50
	do	Traveling expenses	14.39
	W. O. Atwater et al	Salaries	996.09
	Chas. D. Woods	Salary	84.20
19	Jas. P. Stow	Motor with switch	162.50
21	Eimer & Amend	Lining bomb	38.05
23	W. O. Atwater	Expenses	33.85
	do	do	4.75
Feb. 5	W. O. Atwater et al	Salaries	911.00

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

NUTRITION INVESTIGATIONS—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
Feb. 5	Chas. D. Woods	Salary	$86.10
11	W. O. Atwater	Traveling expenses	10.45
	J. Burkitt Webb	Paper	5.50
	W. O. Atwater	Expenses	83.00
Mar. 2	W. O. Atwater et al	Salaries	693.50
	Chas. D. Woods	Salary	77.80
	Total third quarter		3,308.68
Apr. 1	The New York, New Haven and Hartford R. R. Co.	Passenger transportation	5.00
	Southern Rwy. Co	do	36.90
3	Densmore Typewriter Co	Repairing typewriter	7.75
4	W. O. Atwater	Traveling expenses	14.99
	do	Expenses	59.50
	Chas. D. Woods	Traveling expenses	67.20
	W. O. Atwater et al	Salaries	1,109.17
	Chas. D. Woods	Salary	86.10
19	L. R. Hazen	Gummed paper	4.00
24	W. O. Atwater	Traveling expenses	9.50
	C. E. Waite	Report for publication	400.00
29	W. O. Atwater	Expenses	5.79
May 2	Chas. D. Woods	Salary	82.40
3	W. O. Atwater et al	Salaries	891.90
8	Western Union Telegraph Co	Telegraph service	2.19
13	The Goodwin & Kintz Co	Capsules, etc	36.13
24	H. S. Grindley	Report	400.00
	R. W. Keeler	Services	16.95
	R. S. Kinney	do	15.75
	H. A. Pratt	do	19.00
	C. R. Hickok	do	18.00
	N. M. Johnson	do	4.90
	O. C. Becker	do	32.60
	R. Bogani	do	36.38
	F. N. Freeman	do	18.40
	J. C. Ware	do	45.00
June 5	C. D. Woods	Salary	85.20
	C. F. Hale	Services	11.15
	R. Bogani	do	33.80
	F. N. Freeman	do	8.90
	N. M. Johnson	do	7.60
	R. S. Kinney	do	6.60
	R. W. Keeler	do	6.00
	O. C. Becker	do	7.75
	H. A. Pratt	do	17.06
7	W. O. Atwater	do	52.10
	W. O. Atwater et al	Salaries	839.50
18	W. O. Atwater	Expenses	16.10
21	Western Union Telegraph Co	Telegraph services	1.41
25	M. E. Jeffa	Report	300.00
	Total fourth quarter		4,818.67
	Supplemental.		
July 5	Helen W. Atwater	Report	150.00
	Chas. D. Woods	Salary	82.40
	W. O. Atwater et al	Salaries	963.00
8	O. S. Blakesley	Calorimeter	247.00
25	W. O. Atwater	Expenses	7.12
29	Harry Snyder	Report	500.00
	C. E. Wait	do	350.00
30	H. G. Grindley	do	350.00
	Total		2,649.52

RECAPITULATION.

First quarter	$3,124.44
Second quarter	3,598.36
Third quarter	3,308.68
Fourth quarter	4,818.67
Supplemental	2,649.52
Total	17,499.67

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

ARLINGTON EXPERIMENTAL FARM.

Date.	Name.	Nature of payment.	Total.
1900.			
Aug. 31	Jno. W. Olden et al	Salaries	$1,014.45
Sept. 29	do	do	941.10
	Total first quarter		1,955.55
Oct. 31	Jno. W. Olden et al	Salaries	997.02
Nov. 30	do	do	1,031.35
Dec. 31	do	do	1,056.95
	Total second quarter		3,085.32
1901.			
Jan. 7	Baker Sedgwick	Labor	4.00
31	Jno. W. Olden et al	Salaries	728.87
Feb. 28	do	do	311.52
Mar. 13	W. M. Galt & Co	Hay	8.62
	Leidy S. Depue	Oats	9.90
30	Jno. W. Olden et al	Salaries	206.10
	Total third quarter		1,269.01
Apr. 4	W. M. Galt & Co	Hay	8.85
9	Leidy S. Depue	Oats	13.20
30	Jno. W. Olden et al	Salaries	418.40
May 17	Rudolph, West & Co	Spades	12.12
31	Jno. W. Olden et al	Salaries	451.20
June 4	W. M. Galt & Co	Hay	16.83
	Cropley & Boteler	Plows	34.00
	L. S. Depue	Oats	16.50
	P. H. Heiskell, jr., & Co	Plow points	17.30
11	Cropley & Boteler	Harrow	11.00
	B. B. Earnshaw & Bro	Corn, etc	21.36
	L. S. Depue	Oats	16.50
	W. M. Galt & Co	Hay	16.95
18	J. T. Walker Sons	Lime	3.75
21	B. B. Earnshaw & Bro	Corn	9.20
	P. H. Heiskell, jr., & Co	Cutter points	4.60
	Len H. Adams & Son	Peas	45.50
25	P. Mann & Co	Bone potash, etc	6.25
	P. H. Heiskell, jr., & Co	Mower	38.00
	do	Plow handles	1.25
27	Mackall Bros	Soda and potash	12.00
29	Jno. W. Olden et al	Salaries	536.95
	Total fourth quarter		1,673.71
	Supplemental.		
July 13	P. H. Heiskell, jr., & Co	Plow points	10.80
17	Church & Stephenson	Lumber	2.18
Aug. 12	Rudolph, West & Co	Horse brushes, etc	.82
	Total		13.80

RECAPITULATION.

First quarter	$1,955.55
Second quarter	3,085.32
Third quarter	1,269.01
Fourth quarter	1,673.71
Supplemental	13.80
Total	7,997.39

ARLINGTON EXPERIMENTAL FARM.

[Appropriation 1900–1901.]

Date.	Name.	Nature of payment.	Total.
1900.			
June 30	Jno. W. Dawson	Salary	$18.00
	Total fourth quarter, 1900		18.00

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

ARLINGTON EXPERIMENTAL FARM—Continued.

Date.	Name.	Nature of payment.	Total.
1900.			
July 5	Geo. A. Shehan	Lumber	$144.41
14	Chas. Olden	Labor	2.00
16	Rudolph, West & Co	Pick handles	3.60
	do	Nails, etc	17.52
	do	Garden tools	35.65
	W. J. Cogswell	Buggy	65.00
19	C. Becker	Harness	43.50
31	Jno. W. Olden et al	Salaries	549.75
Aug. 3	Jas. B. Lambie	Mattock, barrow, etc	36.00
14	Geo. M. Barker	Glazing	6.68
	Rudolph, West & Co	Grindstone, etc	9.48
25	Church & Stephenson	Lumber	213.74
Sept. 12	Rudolph, West & Co	Bench, wrench, etc	9.23
15	Chas. Becker	Linseed oil	1.20
17	Jas. B. Lambie	Hardware	21.85
	Total first quarter, 1901		1,159.61
Oct. 2	Hugh Reilly	Paint	.50
10	Church & Stephenson	Lumber	70.87
12	Rudolph, West & Co	Hardware	4.92
30	Hugh Reilly	Glass	3.56
	Geo. F. Muth & Co	Lead and turpentine	2.02
Nov. 3	P. Mann & Co	Scraper, plow, etc	19.50
	do	Coulter, etc	7.25
17	Rudolph, West & Co	Hardware	16.80
24	W. M. Galt & Co	Hay	8.25
27	B. B. Earnshaw & Bro	Rye straw	3.54
	Leidy S. Depue	Oats and corn	7.85
Dec. 5	Rudolph, West & Co	Shovels and spades	13.33
	Leidy S. Depue	Oats	23.10
17	P. Mann & Co	Road scraper, etc	11.60
	James B. Lambie	Hardware	7.10
	W. M. Galt & Co	Hay	9.33
	Total second quarter		209.52
1901.			
Jan. 4	Leidy S. Depue	Oats	16.50
5	W. M. Galt & Co	Hay	33.90
7	Thos. W. Smith	Lumber	64.80
	Fred. A. Schmidt	Repairing transit	2.00
	B. B. Earnshaw & Bro	Feed	4.60
12	P. H. Heiskell, jr., & Co	Draintile	151.60
14	Rudolph, West & Co	Axle grease	.48
22	P. Mann & Co	Shares	.70
24	Harry B. Lyford	Spades, etc	21.75
29	P. H. Heiskell, jr., & Co	Draintile	140.00
Feb. 11	Church & Stephenson	Lumber	15.00
Mar. 19	B. B. Earnshaw & Bro	Corn and straw	16.76
	Jas. B. Lambie	Files	1.33
	Total third quarter		469.42
June 25	P. H. Heiskell, jr., & Co	Mower	38.00
	Total fourth quarter		38.00
	Supplemental.		
Aug. 19	Melville Lindsay	Rubber boots	38.50
Sept. 3	B. T. Galloway	Expenses	9.50
Oct. 11	The Geo. W. Knox Express Co	Transportation	6.09
	Total		54.09

RECAPITULATION.

Fourth quarter, 1900	$18.00
First quarter, 1901	1,159.61
Second quarter, 1901	209.52
Third quarter, 1901	469.42
Fourth quarter, 1901	38.00
Supplemental	54.09
Total	1,948.64

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

PUBLIC ROAD INQUIRIES.

Date.	Name.	Nature of payment.	Total.
1900.			
July 25	Martin Dodge	Traveling expenses	$61.44
31	Martin Dodge et al	Salaries	397.60
Aug. 3	E. G. Harrison	Salary	151.60
4	Martin Dodge	Traveling expenses	32.20
16	E. G. Harrison	do	18.54
	do	do	7.61
31	Martin Dodge et al	Salaries	397.60
Sept. 1	do	Traveling expenses	81.91
5	R. P. Clarke Co	Sheet and tape	1.60
18	E. G. Harrison	Salary	151.60
19	Rudolph, West & Co	Hammer	.50
22	H. S. Earle	Services	72.00
24	United States Envelope Co	Envelopes	18.55
27	Houghton & Delano	Photograph holders	7.50
29	Martin Dodge et al	Salaries	384.80
	Total first quarter		1,785.05
Oct. 2	J. A. Holmes	Salary	40.00
3	E. G. Harrison	do	146.80
5	Michigan Central R. R. Co	Passenger transportation	4.00
9	M. O. Eldridge	Traveling expenses	57.25
10	E. G. Harrison	do	23.25
	H. S. Earle	do	17.07
	D. Frank Parker	Typewriter paper	22.50
13	Martin Dodge	Traveling expenses	205.70
	do	Expenses	6.00
16	M. O. Eldridge	Traveling expenses	28.41
	H. S. Earle	Salary	168.00
23	The Press Clipping Bureau	Clippings	20.00
24	H. S. Earle	Traveling expenses	62.15
	The Atchison, Topeka and Santa Fe Rwy. Co	Passenger transportation	14.00
26	H. H. Gross	Services	120.00
31	Martin Dodge et al	Salaries	397.60
Nov. 2	United States Envelope Co	Envelopes	4.55
	do	do	14.00
3	E. G. Harrison	Salary	151.60
	The Chesapeake and Potomac Telephone Co	Rent	4.14
14	Martin Dodge	Traveling expenses	85.35
	T. H. Musson	Salary	60.00
16	J. A. Holmes	do	200.00
19	Houghton & Delano	Slide boxes	2.00
20	L. W. Page	Salary	176.00
	H. H. Gross	do	120.00
	The Murray Lyceum Bureau	Lantern slides	2.80
	Geo. B. Killian Co	Paper boxes	3.00
	M. O. Eldridge	Traveling expenses	80.09
	do	Expenses	12.00
	do	do	5.00
21	H. S. Earle	Traveling expenses	21.66
24	Pennsylvania R. R. Co	Passenger transportation	9.00
28	Jas. W. Abbott	Traveling expenses	22.50
	do	Salary	200.00
	H. S. Earle	do	32.00
30	Martin Dodge et al	Salaries	384.80
Dec. 3	The Press Clipping Bureau	Clippings	10.00
	E. G. Harrison	Salary	146.80
	Logan W. Page	Traveling expenses	60.65
11	do	Salary	200.00
15	Jas. W. Abbott	do	176.00
	do	Traveling expenses	81.50
17	Mackall Bros	Adhesive plasters	.35
18	E. G. Harrison	Traveling expenses	20.50
19	M. O. Eldridge	do	9.00
	do	Expenses	2.50
20	Soule Photo Co	Slides	2.40
	Baltimore and Ohio R. R. Co	Passenger transportation	9.00
21	The Press Clipping Bureau	Clippings	10.00
26	Martin Dodge	Traveling expenses	72.45
31	Martin Dodge et al	Salaries	549.20
	Total second quarter		4,273.57
1901.			
Jan. 2	Pennsylvania R. R. Co	Passenger transportation	38.25
3	T. H. Musson	Salary	78.00
4	Robt. Stone	Traveling expenses	27.75
	Logan W. Page	Salary	192.00
5	do	Traveling expenses	47.45
	J. A. Holmes	do	31.40
	do	Expenses	60.35

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

PUBLIC ROAD INQUIRIES—Continued.

Date.	Name.	Nature of paymant.	Total.
1901.			
Jan. 14	J. H. Stout	Services	$496.00
	J. A. Holmes	do	128.94
	do	do	264.00
16	Martin Dodge	Traveling expenses	25.75
19	W. H. Rau	Lantern slides	6.00
22	T. H. Musson	Salary	78.00
31	Martin Dodge et al	Salaries	561.50
Feb. 4	Logan W. Page	Salary	176.00
5	W. C. Burnett	Labor	23.30
6	The Atchison, Topeka and Santa Fe Rwy. Co	Passenger transportation	61.10
	Pere Marquette R. R. Co	do	2.25
	Pennsylvania R. R. Co	do	4.57
11	The Press Clipping Bureau	Clippings	10.00
	do	do	8.91
12	J. H. Stout	Salary	106.00
	The Chesapeake and Potomac Telephone Co	Rent	6.25
16	M. O. Eldridge	Traveling expenses	5.70
18	Jas. W. Abbott	do	26.75
	do	Salary	160.00
28	Martin Dodge et al	Salaries	437.00
Mar. 1	Fannie C. Harrison	Traveling expenses	7.76
2	Martin Dodge	do	71.05
5	L. W. Page	Salary	155.60
12	Martin Dodge	Traveling expenses	13.06
13	Adams Bros	Ventilator	1.00
18	Dennison Manufacturing Co	Tags	6.00
20	J. H. Stout	Salary	96.00
	Martin Dodge	Traveling expenses	12.60
23	M. O. Eldridge	do	7.75
30	Martin Dodge et al	Salaries	618.70
	Total third quarter		4,052.67
Apr. 1	Jas. W. Abbott	Salary	176.00
	Pennsylvania R. R. Co	Passenger transportation	4.57
	do	do	6.80
9	The Geo. W. Knox Express Co	Transportation	.75
12	J. A. Holmes	Salary	280.00
16	M. O. Eldridge	Expenses	15.00
18	J. A. Holmes	Traveling expenses	115.15
25	The Press Clipping Bureau	Clippings	10.00
	do	do	10.00
27	Adams Express Co	Tranportation	7.27
30	Martin Dodge et al	Salaries	553.70
May 1	Jas. W. Abbott	Salary	120.00
	J. H. Stout	do	96.00
3	The Chesapeake and Potomac Telephone Co	Telephone rent	6.25
25	M. O. Eldridge	Traveling expenses	10.00
27	Baltimore and Ohio R. R. Co	Passenger transportation	5.15
31	Martin Dodge et al	Salaries	359.60
June 1	J. H. Stout	Salary	130.00
	J. W. Abbott	do	100.00
11	do	do	100.00
13	Houghton & Delano	Slide plates	.41
14	The Chesapeake and Potomac Telephone Co	Moving telephone	.45
	The Press Clipping Bureau	Clippings	10.00
18	H. B. Hawkins	Lantern slides	4.50
21	Western Union Telegraph Co	Telegraph service	4.18
	do	do	7.82
	do	do	3.15
	do	do	2.73
	do	do	1.39
	do	do	6.49
	do	do	13.34
29	Martin Dodge et al	Salaries	347.70
	Total fourth quarter		2,508.40
	Supplemental.		
July 2	Martin Dodge	Salary	419.00
6	do	Traveling expenses	150.95
13	Houghton & Delano	Photographic supplies	2.60
16	M. O. Eldridge	Traveling expenses	76.93
Aug. 2	United States Envelope Co	Envelopes	10.10
	do	do	44.80
6	Jas. W. Abbott	Salary	264.00
9	T. H. Musson	Traveling expenses	71.95
12	The Geo. W. Knox Express Co	Transportation	6.39
	J. A. Holmes	Salary	200.00
21	The Chesapeake and Potomac Telephone Co	Service	6.25
23	The American Press Information Bureau	Clippings	51.00

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

PUBLIC ROAD INQUIRIES—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
Aug. 30	The Press Clipping Bureau	Clippings	$10.00
	do	do	10.00
Oct. 3	Martin Dodge	Traveling expenses	8.75
5	Baltimore and Ohio R. R. Co	Passenger transportation	10.85
11	The Geo. W. Knox Express Co	Transportation	2.91
	Total		1,346.48

RECAPITULATION.

First quarter	$1,785.05
Second quarter	4,273.57
Third quarter	4,052.67
Fourth quarter	2,508.40
Supplemental	1,345.48
Total	13,965.17

PUBLICATIONS—FARMERS' BULLETINS.

1900.			
July 31	A. I. Mudd	Salaries	$467.60
Aug. 31	do	do	456.31
Sept. 29	do	do	475.49
	Total first quarter		1,399.40
Oct. 31	S. Edwin Thornton et al	Salaries	413.70
Nov. 30	do	do	436.60
Dec. 31	do	do	349.70
	Total second quarter		1,200.00
1901.			
Jan. 26	The Maurice Joyce Engraving Co	Engraving	33.00
31	S. Edwin Thornton et al	Salaries	377.25
Feb. 7	Geo. G. Hill	Manuscript for bulletin	125.00
16	Geo. W. Poole	Specification for building	10.00
19	Chas. H. Smith	Drawing for barn	16.00
	do	Drawing for farm	20.00
28	S. Edwin Thornton et al	Salaries	366.80
Mar. 18	Gatchell & Manning	Diagrams and plans	13.25
	The Publishers and Printers' Engraving Co	Engraving	10.74
30	S. Edwin Thornton et al	Salaries	396.60
	Total third quarter		1,368.64
Apr. 3	The Publishers and Printers' Engraving Co	Engravings	10.59
30	C. H. Greathouse et al	Salaries, April	515.20
May 31	do	Salaries, May	529.52
June 29	do	Salaries, June	574.50
	Total fourth quarter		1,629.81

RECAPITULATION.

First quarter	$1,399.40
Second quarter	1,200.00
Third quarter	1,368.64
Fourth quarter	1,629.81
Total	5,597.85

ARTISTS, DRAFTSMEN, ENGRAVERS, ETC.

Date.	Name.	Nature of payment.	Total.
1900.			
July 31	L. S. Williams et al	Salaries	$4,096.47
Aug. 10	J. P. Nawrath	White linen	18.50
14	The Maurice Joyce Engraving Co	Engraving	2.08
21	Fred. A. Schmidt	Drawing, etc	10.58
25	Easton & Rupp	Scrapbooks	16.00
29	The Marine Review Publishing Co	Photos	3.75
	Fred. A. Schmidt	Artists' materials	22.00
	do	Cardboard	11.00
31	L. S. Williams et al	Salaries	4,118.91

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

ARTISTS, DRAFTSMEN, ENGRAVERS, ETC.—Continued.

Date.	Name.	Nature of payment.	Total.
1900.			
Sept. 7	The Randolph Paper Box Co	Boxes	$33.75
21	Geo. Meier & Co	Gum arabic	66.00
24	Library Bureau	Index cards	44.80
	Southern Printers Supply Co	Electros	.70
29	L. S. Williams et al	Salaries	3,957.27
	Total first quarter		12,401.81
Oct. 4	Emil Greiner	Graduates	1.94
15	J. P. Nawrath	Twine	38.25
16	Rudolph, West & Co	Brushes, etc	28.85
	Houghton & Delano	Bath tray	6.00
	Ernest Betz	Iron cups	4.80
30	Geo. F. Muth Co	Glass	3.00
	Fred. A. Schmidt	Ink	6.75
	do	Reducing glasses	5.00
31	L. S. Williams et al	Salaries	4,022.80
Nov. 2	Library Bureau	Index cards	56.00
	Mackall Bros	Nitrate silver, etc	31.29
19	Houghton & Delano	Photo supplies	56.66
	do	do	1.55
20	The Maurice Joyce Engraving Co	Engraving	7.24
	do	do	3.75
	Fred. A. Schmidt	Paper and dividers	18.46
21	Sarah I. Proctor	Salary	36.52
23	V. Grottenthaler Co	Boxwood blocks	21.12
	Houghton & Delano	Camera, lens, etc	141.52
27	Fred. A. Schmidt	Solar paper	7.61
30	L. S. Williams et al	Salaries	3,219.40
Dec. 15	W. M. Hays	Article, Plant Breeding	300.00
17	Houghton & Delano	Seed plates, etc	6.74
	J. E. Turton	Tags	22.50
18	Library Bureau	Binders	6.60
20	United States Envelope Co	Envelopes	4,819.86
31	L. S. Williams et al	Salaries	3,175.43
	Total second quarter		16,052.64
1901.			
Jan. 4	V. Grottenthaler Co	Boxwood	47.88
18	Richd. L. Lamb	Ribbons for stamps	.60
26	Fred. A. Schmidt	Solar paper	3.78
29	Mackall Bros	Chemicals	1.17
31	L. S. Williams et al	Salaries	4,029.27
Feb. 13	The Randolph Paper Box Co	Boxes, etc	12.00
23	Houghton & Delano	Photo supplies	9.28
	The Publishers and Printers' Engraving Co	Engravings	3.44
26	Geo. F. Muth & Co	Pens, ink, etc	10.40
28	L. S. Williams et al	Salaries	3,848.72
Mar. 13	Fred. A. Schmidt	Drawing materials	15.50
19	Mackall Bros	Nitrate of silver	32.52
30	L. S. Williams et al	Salaries	4,051.47
	Total third quarter		12,066.03
Apr. 1	John C. Parker	Copier	1.25
3	The Publishers and Printers' Engraving Co	Engravings	5.98
9	The Maurice Joyce Engraving Co	do	1.50
16	J. Manz Engraving Co	do	15.00
	S. P. Johnson	Attachment for typewriter	5.00
17	Southern Printers' Supply Co	Woodcuts	3.00
19	Gatchel & Manning	Engraving	3.00
25	Fred. A. Schmidt	Artists' material	37.60
30	L. S. Williams et al	Salaries	4,140.89
May 1	Fred. A. Schmidt	Drawing instruments	14.55
May 16	Southern Printers' Supply Co	Woodcuts	2.00
	Z. D. Gilman	Glass	21.00
28	Wm. H. Rupp	Paper	2.00
	The Maurice Joyce Engraving Co	Map	5.60
	do	Engraving initials	.50
June 11	Angelo F. Small	Salary	15.00
	The Maurice Joyce Engraving Co	Electrotypes	3.30
28	R. Carter Ballantyne	Pens	2.17
29	H. S. Walter et al	Salaries	2,578.12
	Total fourth quarter		6,857.47
	Supplemental.		
July 2	Southern Printers' Supply Co	Electros	6.75
	Fred. A. Schmidt	Artists' materials	99.46
	Total		106.21

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

RECAPITULATION.

First quarter	$12,401.81
Second quarter	16,052.64
Third quarter	12,066.03
Fourth quarter	6,857.47
Supplemental	106.21
Total	47,484.16

PURCHASE AND DISTRIBUTION OF VALUABLE SEEDS.

Date.	Name.	Nature of payment.	Total.
1900.			
July 31	R. J. Whittleton et al	Salaries	$1,508.90
Aug. 1	Saml. H. Moore	Library portfolios	23.25
20	J. M. Thorburn & Co	Seeds	1.50
21	C. F. Curtiss	do	100.00
31	R. J. Whittleton et al	Salaries	1,508.90
Sept. 7	Fredk. S. Morse	Pineapple plants	23.00
17	Austin Smith	Blotting paper	9.20
18	Iowa Seed Co	Seed wheat	22.00
29	R. J. Whittleton et al	Salaries	1,739.87
	Total first quarter		4,936.62
Oct. 20	Jno. C. Parker	Seed bags	36.54
31	R. J. Whittleton et al	Salaries	1,795.84
Nov. 2	The Chesapeake and Potomac Telephone Co.	Rent	6.25
		Expenses	10.76
9	Wm. B. Stockman	Seeds	102.50
20	A. C. Nellis	do	36.00
	do	do	179.40
21	Plant Seed Co	Bulbs	2,381.58
	Polman Mooy	Salaries	2,598.20
30	R. J. Whittleton et al	do	217.51
	Matthias Haggerty et al	Boxes	72.51
Dec. 8	Alex. Schmidt	Salaries	2,739.86
31	R. J. Whittleton et al	do	160.21
	A. C. Mann et al		
	Total second quarter		10,337.16
1901.			
Jan. 3	The C. A. Smurthwaite Produce Co	Seeds and sacks	302.72
4	Richard E. Kunze	Seeds	5.00
	J. M. Thornburn & Co	do	138.69
	J. Louis Loose	Plants	115.00
14	M. Du Perow	Desk telephones	21.00
16	The Geo. W. Knox Express Co	Transportation	112.86
19	W. F. Allen	Plants	90.00
	A. G. Delmas	Pecan nuts	32.00
24	Reading Paper Mills	Paper	45.00
26	Utah Sugar Co	Sugar-beet seed	100.00
	Jas. R. Collins	Seed bags	153.74
	Thos. Meehan & Sons	Plants	18.35
30	Herbert Post	Nuts	80.00
31	R. J. Whittleton et al	Salaries	2,001.10
	A. C. Mann et al	do	196.40
Feb. 1	Adolph Falck	Beet seed	480.00
2	J. P. Nawrath	Cotton	6.38
	Austin Smith	Blotting paper	9.20
5	Jas. R. Collins	Seed bags	26.84
	Samuel Miller	Pecan seedlings	10.00
11	Willett & Gray	Sugar-beet seed	537.60
12	O. D. Faust	Pecans	10.00
	G. W. Boynton	Russian cucumber seed	1.00
	The Chesapeake and Potomac Telephone Co.	Rent	6.25
	do	do	1.70
14	The Geo. W. Knox Express Co	Transportation	2.14
19	E. E. Risien	Pecans	25.00
	Stewart Pecan Co	do	48.75
21	New York Market Gardeners' Association	Seeds	4,240.71
26	The Chesapeake and Potomac Telephone Co.	Labor	11.38
		Cane seed	92.28
27	Seth H. Kenney & Son	Salaries	2,184.00
28	R. J. Whittleton et al	do	177.20
	A. C. Mann et al	Corn	12.50
Mar. 2	T. W. Wood & Sons	Seeds	9,670.06
5	New York Market Gardeners' Association	Seeds and bags	19.20
7	The Henry Phillipps Seed and Implement Co.	Seeds	180.00
16	J. M. Thornburn & Co		

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

PURCHASE AND DISTRIBUTION OF VALUABLE SEEDS—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
Mar. 16	New York Market Gardeners' Association.	Seeds	$11,060.18
18	California Nursery Co.	Walnut trees	7.50
	Edmund Starke	Seeds	400.00
	Alice F. Crane	do	20.00
	Fredk. Spiker	Rye	2.00
	G. W. Wetherell	Wheat	20.00
	Mary Best	Sorghum seeds	562.50
	Suzuki & Iida	Freight on seeds	2.03
	August Rolker & Sons	Seeds	485.00
	Suzuki & Iida	do	49.40
	S. De Mroziuski	Oats	60.00
19	T. S. Hubbard & Co.	Grapevines	195.65
25	The Chesapeake and Potomac Telephone Co.	Moving telephone	1.55
29	New York Market Gardeners' Association.	Seeds	17,472.85
30	R. J. Whittleton et al	Salaries	2,542.67
	A. C. Mann et al	do	196.40
	Total third quarter		54,241.78
Apr. 1	Jno. C. Parker	Manila paper	30.50
6	do	do	14.63
9	New York Market Gardeners' Association.	Seeds	14,094.87
11	Maggie E. Renshaw	Pecans	1.00
12	Jas. R. Collins	Seed bags	31.71
	J. H. H. Boyd	Seeds	11.10
16	New York Market Gardeners' Association.	do	11,465.88
18	Thos. Mecham & Sons	Black walnut stocks	1.25
19	G. L. Taber	Plants	16.00
	J. M. Thornburn & Co.	Clover seed	10.80
	T. W. Wood & Sons	Seeds	27.60
24	T. S. Hubbard & Co	Grapevines	123.25
	F. S. Phoenix	Nut trees	30.25
29	T. S. Williams	Seeds	1.75
30	R. J. Whittleton et al	Salaries	2,733.95
	A. C. Mann et al	do	187.90
May 1	Will W. Tracy, jr	Expenses	39.98
2	Dammann & Co	Seeds	2.63
3	The Chesapeake and Potomac Telephone Co.	Telephone rent	6.25
	do	do	6.25
	New York Market Gardeners' Association.	Seeds	15,786.82
6	Reading Paper Mills	Manila paper	45.00
	J. Steckler Seed Co., Limited	Pecan nuts	75.00
8	Western Union Telegraph Co	Telegraph service	1.48
13	Austin Smith	Blotting paper	9.20
	W. F. Allen	Strawberry plants	28.90
	Blue Line Transfer Co	Transportation	6.02
20	J. M. Thornburn & Co.	Salt bush	35.00
	Stuart Pecan Co	Pecan trees	8.00
24	H. L. Galloway	Seeds	25.62
28	Western Union Telegraph Co	Telegraph service	1.08
31	R. J. Whittleton et al	Salaries	1,505.55
	A. C. Mann et al	do	194.20
June 14	D. M. Ferry & Co	Seeds	.60
	W. A. Burpee & Co	do	4.17
	Peter Henderson & Co	do	2.20
	J. M. Thornburn & Co.	do	13.60
	do	do	2.15
17	The Livingston Seed Co	do	1.20
18	T. S. Hubbard Co	Grapevines	3.43
	T. Watase	Seed rice	540.00
21	Louis Leroy	Grapevines	22.66
	Western Union Telegraph Co	Telegraph service	3.90
25	Fred Springmann	Hauling	5.40
29	R. J. Whittleton et al	Salaries	1,384.93
	A. C. Mann et al	do	187.90
	Total fourth quarter		48,731.56
	Supplemental.		
July 13	Reasoner Bros.	Seeds	31.10
16	New York Market Gardeners' Association.	do	6,782.99
17	J. L. Loose	Small fruits	20.00
19	D. Landreth & Sons	Seeds	40.50
20	J. M. Thornburn & Co.	do	.50
25	Peter Henderson & Co	do	17.50
Aug. 1	J. R. Freeman	Plants	233.50
19	Wm. Bull	Seeds	83.70

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

PURCHASE AND DISTRIBUTION OF VALUABLE SEEDS—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
Aug. 21	The Chesapeake and Potomac Telephone Co.	Service	$10.34
Oct. 2	Vilmorin, Andrieux & Co	Seeds	3.22
	J. L. Loose	Plants	233.50
	T. S. Hubbard Co	Vines, etc	3.12
	F. Sander & Co	Plants	38.45
	Vilmorin, Andrieux & Co	Seeds	138.63
10	Jas. Veitch & Sons	Plants	58.15
11	The Geo. W. Knox Express Co	Transportation	.70
	Total		7,695.90

RECAPITULATION.

First quarter	$4,936.62
Second quarter	10,337.16
Third quarter	54,241.78
Fourth quarter	48,731.56
Supplemental	7,695.90
Total	125,943.02

FOREIGN SEED AND PLANT INTRODUCTION.

Date.	Name.	Nature of payment.	Total.
1900.			
July 31	Jared G. Smith et al	Salaries	$715.00
Aug. 1	M. A. Carleton	Salary	303.30
11	Cheshire Manufacturing Co	Copper labels	5.62
	Walter T. Swingle	Traveling expenses	24.70
21	Anderson & Co	Foreign seeds	185.43
	Alex. Tacussal & Son	Grape cuttings	83.25
31	Jared G. Smith et al	Salaries	699.20
Sept. 4	M. A. Carleton	Salary	151.60
7	Peter Henderson & Co	Wheat	52.20
	United States Envelope Co	Envelopes	13.80
15	Houghton & Delano	Mounts	.85
17	Peter Henderson & Co	Bulbs	105.00
	Max. Koch	Seeds	45.75
	Vilmorin, Andrieux & Co	Tobacco seeds	20.00
18	J. B. Davy	Chinese water chestnuts	2.50
24	Robt. Gair	Seed pockets	32.76
	The Geo. W. Knox Express Co	Transportation	1.25
	Vilmorin, Andrieux & Co	White lupine	67.79
29	Jared G. Smith et al	Salaries	681.60
	Total first quarter		3,191.60
Oct. 2	M. A. Carleton	Salary	73.37
	D. G. Fairchild	do	59.78
3	J. P. William & Bro	Seeds	24.33
4	United States Envelope Co	Envelopes	15.40
	W. W. Michaux	Wheat	10.30
5	Thos. Cook & Son	Passenger transportation	105.84
	Pennsylvania R. R. Co	do	10.00
9	J. Crawford	Rubber plant seeds	20.00
10	R. Carter Ballantyne	Tags	2.20
16	Ernest Betz	Mailing tubes	7.20
	D. Frank Parker	Typewriter paper	3.75
20	M. A. Carleton	Expenses	280.04
	R. Carter Ballantyne	Tags	3.70
30	Mackall Bros	Moth balls, etc	2.25
	Postal Telegraph Cable Co	Cablegram	4.41
31	J. G. Smith et al	Salaries	480.47
Nov. 2	Library Bureau	Cards	21.60
	Vilmorin, Andrieux & Co	Wheat	39.60
	Western Union Telegraph Co	Telegraph service	33.21
3	W. T. Swingle	Salary	168.50
5	J. P. Williams & Bro	Tea seeds	58.40
12	M. A. Carleton	Traveling expenses	572.36
20	Edmund Manthner	Wheat, etc	106.47
27	The George W. Knox Express Co	Transportation	51.19
	J. G. Smith	Traveling expenses	14.90
30	J. G. Smith et al	Salaries	395.26

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

FOREIGN SEED AND PLANT INTRODUCTION—Continued.

Date.	Name.	Nature of payment.	Total.
1900.			
Dec. 1	Walter T. Swingle	Salary	$163.00
3	United States Envelope Co	Manila envelopes	7.70
14	Jas. R. Collins	Seed bags	31.70
	Chas. U. Shepard	Expenses	38.08
17	The Geo. W. Knox Express Co	Transportation	323.82
18	Gustav Zulzer	Clover seeds	12.56
29	Trumbull & Beebe	Seeds	12.00
31	J. G. Smith et al	Salaries	430.10
	Total second quarter		3,583.49
1901.			
Jan. 3	Chr. Lorenz	Seeds	2.45
4	W. T. Swingle	Salary	168.50
7	U. S. Express Co	Transportation	38.62
18	Church & Stephenson	Lumber	22.43
21	D. G. Fairchild	Expenses	35.55
	United States Envelope Co	Envelopes	45.15
26	Wm. R. Rupp, Agt	do	4.25
31	J. G. Smith et al	Salaries	569.33
Feb. 1	Vilmorin, Andrieux & Co	Seeds	48.62
2	The Ball and Socket Manufacturing Co	Labels	12.00
4	E. M. V. Proskowetz, jr	Seeds	105.56
5	F. Sgaravatti	Seedless raisin grapes	40.53
	J. Colombo	Alfalfa seeds	6.76
11	Church & Stephenson	Lumber	3.60
13	Vilmorin, Andrieux & Co	Seeds	5.16
20	M. A. Carleton	Expenses	7.00
23	Western Union Telegraph Co	Telegraph service	10.86
26	Rudolph, West & Co	Hinges	1.08
27	Adams Express Co	Transportation	8.33
	do	do	13.17
28	J. G. Smith et al	Salaries	507.54
Mar. 2	Edw. S. Schmidt	Moss	3.75
	Jas. R. Collins	Cotton-seed bags	62.77
13	J. G. Smith	Traveling expenses	55.35
14	R. Carter Ballantyne	Mimeograph and tags	17.20
	Church & Stephenson	Lumber	78.00
	The Geo. W. Knox Express Co	Transportation	112.02
18	Vilmorin, Andrieux & Co	Seeds	56.75
	Library Bureau	Cards	.48
	Aug. Rhotert	Custom-house charges	1.50
	Alfred Dale	Cotton seeds, etc	20.02
	L. Boehmer & Co	Japanese hemp	92.50
19	R. G. Shaw & Co	Indian tea seeds	50.88
30	Ernst A. Bessey et al	Salaries	529.61
	Total third quarter		2,737.32
Apr. 1	G. D. Brill	Salary	2,000.00
	Pennsylvania R. R. Co	Passenger transportation	15.85
	Southern Pacific Co	do	10.85
6	Jno. C. Parker	Letter books, etc	11.50
12	Jas. R. Collins	Seed bags	113.19
20	Southern California Rwy. Co	Transportation	40.02
22	Dammann & Co	Wheat	45.60
	Houston and Texas Central R. R. Co	Passenger transportation	4.95
27	United States Express Co	Transportation	70.22
	do	do	10.55
	Adams Express Co	do	12.88
29	G. D. Brill	Expenses	115.17
	Vilmorin, Andrieux & Co	Seeds	.93
30	Ernst A. Bessey et al	Salaries	567.00
May 2	J. P. Williams & Bros	Tea seed	48.67
	Vilmorin, Andrieux & Co	Seeds	28.76
3	The Chesapeake and Potomac Telephone Co.	Telephone rents	6.25
	United States Express Co	Transportation	4.00
21	Paul Hiser, jr., & Bro	Flower pots	66.00
27	International and Great Northern R. R. Co	Passenger transportation	5.90
	The Texas and Pacific Rwy. Co	do	19.15
	Southern Rwy. Co	do	22.65
28	Western Union Telegraph Co	Service	6.89
	do	do	2.71
	Blue Line Transfer Co	Transportation	14.75
31	E. A. Bessey et al	Salaries	541.00
June 7	C. S. Scofield	Services	85.20
15	Rudolph, West & Co	Hardware	3.84
18	J. P. Williams & Bro	Seeds	27.98
	T. Watase	do	125.00
	do	do	79.00

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

FOREIGN SEED AND PLANT INTRODUCTION—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
June 18	R. Carter Ballantyne	Tags	$4.46
21	Western Union Telegraph Co	Service	1.99
22	J. E. Turton	Tags	9.00
25	Baltimore and Ohio R. R. Co	Passenger transportation	20.25
29	E. A. Bessey et al	Salaries	527.00
	Total fourth quarter		4,169.16
	Supplemental.		
July 5	W. T. Swingle	Traveling expenses	11.80
	C. S. Scofield	Salary	41.20
	Adams Express Co	Transportation	22.68
8	Vilmorin, Andrieux & Co	Seeds	4.05
	Rossier Freres et Soenn	Trees	28.95
	C. A. Nobelius	Apple trees	53.53
	F. Ferguson & Son	Fruit trees	16.30
	Hunter & Sons	do	18.12
13	The Geo. W. Knox Express Co	Transportation	117.64
16	T. Watase	Tea seed	100.00
19	United States Express Co	Transportation	151.01
30	Jno. C. Parker	Letter files	1.05
Aug. 2	Lindahls Frohandel	Seeds	4.69
	F. A. Tschiffely, jr	Carbon	2.50
9	Carl S. Scofield	Expenses	4.54
	do	Traveling expenses	31.57
20	United States Envelope Co	Envelopes	7.70
	do	do	13.80
21	Chesapeake and Potomac Telephone Co	Service	6.25
Oct. 2	William Jacobs Owen & Co	Seeds, etc	96.61
	R. F. Patterson	Freight charges	21.90
11	The Geo. W. Knox Express Co	Transportation	17.66
	Total		773.55

RECAPITULATION.

First quarter	$3,191.60
Second quarter	3,583.49
Third quarter	2,737.32
Fourth quarter	4,169.16
Supplemental	773.55
Total	14,455.12

INVESTIGATING PRODUCTION OF DOMESTIC SUGAR.

Date.	Name.	Nature of payment.	Total.
1900.			
July 31	M. S. Chamberlin et al	Salaries	$100.50
Aug. 11	Chas. F. Saylor	Salary	225.00
	do	Expenses	5.25
17	do	Traveling expenses	96.36
31	M. S. Chamberlin et al	Salaries	100.50
Sept. 7	J. P. Nawrath	Wax paper	73.50
18	Chas. F. Saylor	Expenses	4.35
	do	Salary	225.00
29	Geo. L. Spencer et al	Salaries	164.22
	Total first quarter		994.68
Oct. 5	Chicago, St. Paul, Minneapolis and Omaha Rwy. Co.	Passenger transportation	6.55
9	Chas. F. Saylor	Salary	225.00
10	R. Carter Ballantyne	Tags	8.80
	Albert A. Denton	Salary	100.00
12	Chas. C. Van Horn	Welsbach mantles	3.00
16	Rudolph, West & Co	Tin cups	2.70
18	Chas. F. Saylor	Traveling expenses	95.93
	do	Expenses	21.75
30	National Electrical Supply Co	Pulley	1.70
31	G. L. Spencer et al	Salaries	235.30
Nov. 2	United States Envelope Co	Envelopes	9.00
	Eimer & Amend	Flasks	35.50

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

INVESTIGATING PRODUCTION OF DOMESTIC SUGAR—Continued.

Date.	Name.	Nature of payment.	Total.
1900.			
Nov. 3	Chas. F. Saylor	Salary	$225.00
22	do	Traveling expenses	98.32
	do	Expenses	9.40
28	Albert A. Denton	Salary	100.00
30	G. L. Spencer et al	Salaries	229.40
Dec. 5	The Minnesota and St. Louis R. R. Co	Passenger transportation	8.92
	Union Pacific R. R. Co	do	7.43
11	Chas. F. Saylor	Salary	225.00
14	United States Envelope Co	Envelopes	23.10
19	E. E. Ewell	Traveling expenses	4.12
20	Jas. R. Collins	Seed bags	19.02
31	Geo. L. Spencer et al	Salaries	139.63
	Total second quarter		1,834.57
1901.			
Jan. 2	Chicago and Northwestern Rwy. Co	Passenger tansportation	9.80
14	Chas. F. Saylor	Salary	225.00
	do	Traveling expenses	124.53
	do	Expenses	39.75
	do	Traveling expenses	41.36
	do	Expenses	17.80
	Jas. B. Lambie	Leather belting	1.32
21	Eimer & Amend	Cover glasses, etc	6.40
31	M. S. Chamberlin et al	Salaries	101.70
Feb. 15	Chas. F. Saylor	Salary	225.00
	do	Expenses	50.00
27	Chicago, Rock Island and Pacific Rwy. Co	Passenger transportation	8.00
28	M. S. Chamberlin et al	Salaries	96.60
Mar. 11	Chas. F. Saylor	Traveling expenses	72.55
	do	Salary	225.00
	do	Traveling expenses	55.00
	do	Expenses	50.00
18	Z. D. Gilman	Mailing cases	12.50
30	M. S. Chamberlin et al	Salaries	101.70
	Total third quarter		1,464.01
Apr. 2	Chas. F. Saylor	Salary	225.00
26	do	Traveling expenses	85.45
	do	Expenses	30.00
30	M. S. Chamberlin et al	Salaries	99.50
May 2	Chas. F. Saylor	Salary	225.00
3	do	Expenses	7.50
	do	Traveling expenses	93.42
31	M. S. Chamberlin et al	Salaries	101.00
June 4	Southern California Rwy. Co	Passenger transportation	54.25
13	Chas. F. Saylor	Salary	225.00
	do	Traveling expenses	97.37
	do	Expenses	7.75
21	D. A. Herzfeld	Negative	97.58
28	H. W. Wiley	Traveling expenses	89.15
29	M. S. Chamberlin et al	Salaries	99.50
	Total fourth quarter		1,537.47
	Supplemental.		
July 19	Chas. F. Saylor	Salary	225.00
	do	Traveling expenses	64.50
	United States Express Co	Transportation	8.79
,26	Baltimore and Ohio R. R. Co	Passenger transportation	12.95
	Chicago, Burlington and Quincy R. R. Co	do	4.21
	The Lake Shore and Michigan Southern Rwy. Co.	do	7.70
	Chicago, St. Paul, Minneapolis and Omaha Rwy. Co.	do	11.50
29	M. A. Scovelle	Raising beets	50.00
	H. A. Huston	do	50.00
30	Jno. A. Widtsoe	do	50.00
	R. H. Snow	do	50.00
	W. B. Alwood	do	50.00
	Jas. Atkinson	do	50.00
31	L. A. Clinton	do	50.00
Aug. 2	Chicago Great Western Rwy. Co	Passenger transportation	8.00
19	Melville Lindsay	Rubber boots	3.50
28	W. H. Jordan	Raising beets	50.00
Oct. 5	Chicago and Northwestern Rwy. Co	Passenger transportation	8.54
	Pennsylvania Co	do	17.50
	Total		772.19

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

RECAPITULATION.

First quarter	$994.68
Second quarter	1,834.57
Third quarter	1,464.01
Fourth quarter	1,537.47
Supplemental	772.19
Total	6,602.92

TEA-CULTURE INVESTIGATION.

Date.	Name.	Nature of payment.	Total.
1900.			
Oct. 12	Chas. U. Shepard	Expenses	$187.42
	Isaac Auld	Services	60.82
16	Rufus Knight	Lumber	23.27
18	O. C. Sires & Bro	Cement, etc	14.65
	J. V. Brandt	Pipe	9.00
Nov. 12	do	Pipe, etc	43.60
14	Marshall, Sons & Co	Apparatus	1,006.03
22	Rumsey & Co	Plunger	6.05
	Hocking Valley Manufacturing Co	Coupling, etc	6.85
	A. R. Tomlinson	Harness	30.00
	Wm. M. Bird & Co	Oil, paint, etc	14.21
	Marshall Wescoat & Co	Staples, etc	3.16
	Chas. U. Shepard	Expenses	104.12
	do	do	37.50
	do	do	35.96
28	Isaac Auld	Hire of mules	10.85
	R. S. Long	Labor	16.25
Dec. 3	The Bailey Lebby Co	Pipe, etc	14.81
	do	do	39.76
14	Chas. U. Shepard	Expenses	125.42
29	The Bailey Lebby Co	Pipe, etc	4.42
	Total second quarter		1,794.15
1901.			
Jan. 3	Chas. U. Shepard	Expenses	35.00
	Isaac Auld	Mule hire	22.05
	J. V. Brandt	Bricks, etc	39.70
	A. W. Taylor	Brick	17.00
	W. B. Austin	Negatives	22.05
21	Isaac Auld	Mule hire	39.55
Feb. 1	Chas. U. Shepard	Expenses	105.00
12	R. S. Long	Labor	31.97
13	Chas. U. Shepard	Expenses	241.92
19	Southeastern Lime and Cement Co	Pipe	33.68
	Total third quarter		587.92
May 3	Chas. U. Shepard	Expenses	35.00
	Jno. F. Riley	Cutter for artesian well	44.67
	O. C. Sires & Bro	Lime	9.00
	Total fourth quarter		88.67

RECAPITULATION.

Second quarter	$1,794.15
Third quarter	587.92
Fourth quarter	88.67
Total	2,470.74

TEA-CULTURE INVESTIGATIONS.

[Appropriation, 1900–1901.]

Date.	Name.	Nature of payment.	Total.
1900.			
July 25	A. J. Limehouse	Posts	$45.50
Aug. 3	Rumsey & Co., Limited	2 horsepower, etc	34.30
23	Chas. U. Shepard	Tea-garden experiments	16.80
	do	do	14.35
	W. B. Austin	Negatives	37.80
	A. J. Limehouse	Cedar posts	47.30

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

TEA-CULTURE INVESTIGATIONS—Continued.

Date.	Name.	Nature of payment.	Total.
1900.			
Aug. 23	Bessie E. Green	Chemical work	$10.00
	Isaac Auld	Mule hire	21.70
	do	do	18.90
	O. C. Sires & Bro	Cement	22.50
29	Marshall Wescoat & Co	Cans	25.75
	Rufus Knight	Lumber	24.79
	do	do	47.77
	Jno. S. Horlbeck	Pipes	46.50
	A. W. Taylor	Bricks	25.12
Sept. 7	Jos. Wild & Co	Matting	468.00
15	Bessie E. Green	Services	8.00
	Isaac Auld	Services, mules	30.45
	Chas. U. Shepard	Expenses	148.21
17	The Bailey-Lebby Co	Wire netting	166.80
	do	Tank	50.00
	A. W. Taylor	Bricks	15.00
21	Rufus Knight	Lumber	4.16
24	A. W. Taylor	Brick	22.50
	Total first quarter		1,352.20
Oct. 2	Hocking Valley Manufacturing Co	Arch stand, etc	4.76
Nov. 22	Chas. U. Shepard	Tank material	6.60
24	Southern Rwy. Co	Transportation	36.49
	Total second quarter		47.85
1901.			
Feb. 19	Jno. F. Riley	Tea-withering machine	226.60
Mar. 11	Chas. U. Shepard	Expenses	262.05
	J. V. Brandt	Brick and clay	6.00
12	The Goulds Manufacturing Co	Iron horsepower	75.00
	Total third quarter		569.65
Apr. 12	The J. L. Mott Iron Works	Furnace	108.00
May 3	Chas. U. Shepard	Expenses	46.55
4	Southern Rwy. Co	Transportation	103.47
	Marshall, Sons & Co., Limited	Tea-sifting apparatus	260.96
	Total fourth quarter		518.98

RECAPITULATION.

First quarter	$2,352.20
Second quarter	47.85
Third quarter	569.65
Fourth quarter	518.98
Total	2,488.68

WEATHER BUREAU—FUEL, LIGHTS, AND REPAIRS.

Date.	Name.	Nature of payment.	Total.
1900.			
July 31	Joshua Carey et al	Salaries	$429.52
Aug. 31	do	do	463.80
Sept. 15	Seth Schell	Repairs to Weather Bureau building.	12.00
	W. H. Butler	Paint	3.00
	Thos. R. Fowler	Hauling ashes	9.00
	Washington Gaslight Co	Gas	31.20
	Forsberg & Murray	Repairs to heating apparatus	89.00
	Wallace & Meuchine	Covering steam pipes	153.00
	Seth Schell	Repairs to heating apparatus	452.00
	National Electrical Supply Co	Plugs	1.80
	Jas. B. Lambie	Lawn mowers	12.36
20	Washington Gaslight Co	Gas	31.90
	Hugh Reilly	Window glass	5.49
30	Joshua Carey et al	Salaries	452.40
	Total first quarter		2,146.47
Oct. 1	Thos. R. Fowler	Hauling	5.75
	do	do	8.00

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

WEATHER BUREAU—FUEL, LIGHTS, AND REPAIRS—Continued.

Date.	Name.	Nature of payment.	Total.
1900.			
Oct. 3	The E. F. Brooks Co	Globes and wicks	$5.40
	The Cranford Paving Co	Laying asphalt	138.25
6	W. H. Dyer	Slat doors	6.75
18	The Allegheny Co	Coal	151.36
	Washington Gaslight Co	Gas	33.30
30	Jno. Maury Dove	Charcoal	.20
	Thos. Somerville & Sons	Supplies	57.18
	do	do	17.69
	Instantaneous Fire Alarm Co	Fire-alarm service	12.50
	Rudolph, West & Co	Metal ceiling	108.00
	Hugh Reilly	Glass	49.60
31	Joshua Carey et al	Salaries	423.80
Nov. 2	Thos. R. Fowler	Hauling ashes	6.75
23	Jno. Moran	Droplight	1.00
	do	Stoves, etc	49.00
	Wm. J. Zeh	Coal	8.09
	Forsberg & Murray	Driving belt	34.00
	Washington Gaslight Co	Gas	35.70
30	Joshua Carey et al	Salaries	410.73
Dec. 3	P. Mann & Co	Bone dust	3.00
10	Thos. R. Fowler	Hauling	10.50
19	Jno. Moran	Stove	12.50
	Washington Gaslight Co	Gas	41.40
	The Allegheny Co	Coal	174.80
	do	do	34.99
31	Joshua Carey et al	Salaries	373.80
	Total second quarter		2,214.04
1901.			
Jan. 3	Johnson Brothers	Wood	2.85
	Jno. Moran	Welsbach burner	5.25
	The Allegheny	Coal	6.44
11	Thos. R. Fowler	Hauling rubbish	12.00
17	Wm. J. Zeh	Coal	10.54
	Johnson Brothers	Wood	5.70
	Washington Gaslight Co	Gas	45.80
	Hugh Reilly	Light glass	1.47
	Jno. Moran	Repairs to gas stoves	6.75
29	Wm. J. Zeh	Coal	4.93
31	Joshua Carey et al	Salaries	423.70
Feb. 9	Jno. Moran	Cover for sewer trap	5.00
	The Allegheny Co	Coal	6.38
	Wm. J. Zeh	do	7.87
	The Allegheny Co	do	332.57
18	Washington Gaslight Co	Gas	48.20
23	Jno. Moran	Repairs to lighting apparatus	6.00
	do	Repairs to building	12.50
	The Allegheny Co	Coal	168.73
29	Joshua Carey et al	Salaries	382.60
	Thos. R. Fowler	Hauling ashes	12.00
Mar. 6	Wm. J. Zeh	Coal	9.14
12	do	do	9.02
	Geo. F. Muth & Co	Oil	1.60
22	Thos. Somerville & Sons	Pipe, etc	9.77
	do	Repairs to heater	3.10
	C. A. Muddiman & Co	Wax tapers	.60
	Washington Gaslight Co	Gas	45.70
	The Allegheny Co	Coal	6.25
	do	do	167.65
30	Joshua Carey et al	Salaries	401.07
	Thos. R. Fowler	Hauling	15.00
	Total third quarter		2,176.18
Apr. 6	The Allegheny Co	Coal	168.85
	National Electrical Supply Co	Lamps	21.60
	M. Du Perow	Cut-outs	1.56
16	Washington Gaslight Co	Gas	52.80
	P. Mann & Co	Fertilizer	10.00
	National Electrical Supply Co	Services	40.00
18	H. C. Roberts Electrical Supply Co	do	.50
24	Wm. J. Zeh	Coal	5.71
30	Joshua Carey et al	Salaries	385.49
May 9	National Electrical Supply Co	Wire	.54
	do	Compression cups	2.40
	Jno. Moran	Repairs to steam pipes	4.50
13	do	Wire gutter guards	5.00
23	Washington Gaslight Co	Gas	46.90
	Hugh Reilly	Glass	1.70

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

WEATHER BUREAU—FUEL, LIGHTS, AND REPAIRS—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
May 23	Hugh Reilly	Glass	$1.00
	The Allegheny Co	Coal	6.81
	do	do	167.83
	Jno. Moran	Repairing washstand	6.00
	Church & Stephenson	Wainscot copings	48.50
31	Thos. R. Fowler	Hauling ashes	10.00
	do	do	11.00
	Joshua Carey et al	Salaries	376.80
June 1	Church & Stephenson	Lumber	17.06
	Jas. B. Lambie	Bar of iron	.66
11	Chas. Becker	Berry's hard oil finish	7.15
	Thos. Somerville	Solder	1.70
18	Geo. F. Muth & Co	Lead	5.95
29	Joshua Carey et al	Salaries	366.60
	Thos. R. Fowler	Hauling ashes	7.50
	Total fourth quarter		1,782.11
	Supplemental.		
July 1	S. S. Shedd & Bro	Supplies, gas fixtures	4.20
6	Hugh Reilly	Glass	1.25
	Washington Gaslight Co	Gas	40.49
	Jno. Moran	Repairing Welsbach light	1.60
	M. Du Perow	Springs	2.40
	The Allegheny Co	Coal	177.42
18	Jno. Moran	Stationary washstand	35.00
	Washington Gaslight Co	Gas	41.60
31	Thos. R. Fowler	Hauling ashes	8.00
Aug. 6	Hugh Reilly	Whiting	.50
	do	Glass	.68
Sept. 13	Barber & Ross	Painting railing	158.40
27	The Allegheny Co	Coal	87.02
	Total		558.56

RECAPITULATION.

First quarter	$2,146.47
Second quarter	2,214.04
Third quarter	2,176.18
Fourth quarter	1,782.11
Supplemental	558.56
Total	8,877.36

WEATHER BUREAU—CONTINGENT EXPENSES.

Date.	Name.	Nature of payment.	Total.
1900.			
July 18	Mary S. Hazen	Supplies	$76.25
24	Postmaster, Washington, D. C	Postage stamps	517.00
25	Otis H. Miller & Bro	Services and material	83.00
	The Post-Office Department	Maps	40.80
Aug. 14	S. J. Meeks's Sons	Spring wagon, etc	145.00
16	S. P. Johnson	Caligraphs	139.50
Sept. 15	Geo. Meier & Co	Bronze gold	3.75
	W. B. Moses & Sons	Office furniture	29.50
	Gustav Hartig	Bar pads, etc	37.70
	Wyckoff, Seamans & Benedict	Typewriter paper	31.50
	Louis Hartig	Nails	6.80
	Chas. Becker	Shellac, etc	31.40
	W. M. Galt & Co	Forage	8.25
	The J. C. Ergood Co	Soap	80.00
	Adams Express Co	Transportation	9.10
	L. S. Depue	Forage	26.40
	Lucy H. Payne	Washing towels	10.25
	Jno. C. Parker	Letterpresses, etc	53.94
	N. Humphrey	Castors	3.90
	Wm. T. Baldus	Phosphorus paste	3.00
	B. B. Ernshaw & Bro	Rye straw, middlings, etc	12.05
	Jas. B. Lambie	Soap, etc	15.48
	W. M. Galt & Co	Hay	12.37
	Capital Traction Co	Street-car tickets	20.00
	do	do	20.00

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

WEATHER BUREAU—CONTINGENT EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
1900.			
Sept. 20	Richard L. Lamb	Numbering machine	$9.80
	L. S. Depue	Forage	13.20
	American Ice Co	Ice	25.96
	Thos. Somerville & Sons	Cement	4.25
	Rudolph, West & Co	Screws	29.46
24	Manhattan Electric Supply Co	Rubber tubing	5.50
25	American Ice Co	Ice	29.00
	Total first quarter		1,534.11
Oct. 1	Jno. C. Parker	Voucher boxes	15.00
	Lucy H. Payne	Washing towels	10.48
3	Albert Kahlert & Co	Storage and cleaning carpets	2.81
	do	do	1.03
	The Andrew J. Joyce Carriage Co	Repairing carriage	41.25
	W. G. Duckett	Medicine for horses	2.85
	do	Santizone	5.00
	Smith Premier Typewriter Co	Repairs to typewriter	5.25
	Jno. Moran	Water well	2.50
	J. T. Walker Sons	Lime	.75
	Church & Stephenson	Lumber	399.84
	J. T. Thomson	Embossing	18.00
	S. J. Meeks's Sons	Repairs to wagon	15.50
	Chas. Becker	Red lead	2.40
	Z. D. Gilman	Borax	.60
	L. S. Depue	Forage	13.20
4	The Chesapeake Electric Co	Sockets	3.50
6	B. B. Ernshaw & Bro	Rye straw	8.21
	The Morris Joyce Engraving Co	Photo plates	34.35
	Jas. B. Lambie	Drills, handles, etc	6.01
	W. M. Galt & Co	Hay	12.37
	M. Du Perow	Fan motors, etc	156.81
	Jno. C. Parker	Paper	239.00
	The Andrew J. Joyce Carriage Co	Rubber tires	55.00
18	Acme Repair and Bicycle Co	Repairing bicycle	6.25
	Hugh Reilly	Umber, etc	1.40
	Geo. F. Muth & Co	Paper	29.89
	do	White lead, etc	41.11
	National Electrical Supply Co	Desks, fans, etc	3.31
	W. B. Moses & Sons	Water coolers, etc	28.40
19	Lucy H. Payne	Towel service	9.41
26	G. E. Stechert	Book	1.15
	Wm. Murray & Son	Roach poison	7.50
30	W. M. Galt & Co	Forage	8.25
	J. T. Walker & Sons	Lime	.75
	The Smith Premier Typewriter Co	Repairs to typewriters	2.70
	Dulin & Martin Co	Cuspidors	3.60
	L. S. Depue	Forage	13.20
	do	do	13.20
	Thos. Somerville & Sons	Iron	29.18
	Wyckoff, Seamans & Benedict	Repairing typewriter	17.35
	R. Carter Ballantyne	Files	11.50
	Wm. Ballantyne & Sons	Dictionaries	19.00
	United States Express Co	Transportation	6.00
	American Ice Co	Ice	24.75
	C. Schneider's Sons	Repairing speaking tube	5.00
	Rudolph, West & Co	Supplies	51.19
	do	Harness, brushes, etc	7.20
	E. J. Pullman	Supplies	7.20
	Lutz & Co	Repairing harness	24.75
	Hugh Reilly	Supplies	83.65
Nov. 19	G. W. Mason	Rubber bumpers	4.00
	Jas. K. Probey	Repairs to wagon	38.50
	The Burnet Co	Nungesser batteries	21.00
22	H. C. Roberts Electric Supply Co	Supplies	8.25
23	Hugh Reilly	Paint and brushes	44.15
	do	Glass	4.97
	The Chesapeake & Potomac Telephone Co	Telephone service	35.00
	do	do	19.57
	Jno. C. Parker	Inkstands, etc	20.16
	Geo. F. Muth & Co	White lead, etc	56.53
	Houghton & Delano	Unmounted prints	1.04
	Fred. A. Schmidt	Blue paper	8.85
	Church & Stephenson	Lumber	139.06
	The Smith Premier Typewriter Co	Repairs to typewriter	5.70
	B. B. Ernshaw & Bro	Forage	3.74
	W. B. Moses & Sons	Furniture	93.12
	Jas. B. Lambie	Stepladder	1.25
	Capital Traction Co	Car tickets	20.00
	J. Baumgarten & Son	Stamps	9.36

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

WEATHER BUREAU—CONTINGENT EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
1900.			
Nov. 23	J. Baumgarten & Sons	Rubber stamps	$2.65
	do	do	1.19
	do	do	3.02
	B. B. Ernshaw & Bro	Forage	5.29
	W. M. Galt & Co	do	8.25
	Geo. F. Muth & Co	Pumice stone	1.25
	The Maurice Joyce Engraving Co	Photoengraving plate	10.00
	Lutz & Co	Lines and saddle pads	5.00
	Literary Bureau	Catalogue cards	20.20
	Jas. B. Lambie	Carpet sweeper	3.00
	Woodruff Manufacturing Co	File crates	70.00
	J. T. Thomson	Embossing envelopes	5.40
	Clark & Davenport	Carpets, etc	113.60
	do	do	111.97
	Wm. H. Kaiser	Earthen jars	6.75
	R. Carter Ballantyne	Labels	1.90
	Jas. K. Probey	Harness	30.00
26	Jno. C. Parker	Paper	289.19
	do	Fountain pen	5.00
30	M. P. Bush	Soap	3.00
Dec. 3	Jno. C. Parker	Fountain pen, etc	7.00
	Lutz & Co	Halters, etc	4.75
	J. Baumgarten & Sons	Rubber stamps	25.06
	Lucy H. Payne	Washing towels	10.55
	W. B. Moses & Sons	Leather seats	12.00
4	Julien P. Friez	Brass ring casting	2.80
10	Hutton & Hilton	Listerine	8.00
	Fred A. Schmidt	Celluloid	.75
	The Maurice Joyce Engraving Co	Photo engravings	4.25
11	India Alkali Works	House savogran	12.00
14	Lutz & Co	Repairing harness	1.25
	Leidy S. Depue	Forage	13.20
	Hugh Reilly	Paint, etc	7.60
	Jno. C. Parker	Stamp cabinet and stamp	14.50
	do	Rubber stripes for typewriter	.50
	W. B. Moses & Sons	Repairing chair	1.00
	do	Shades and repairing chair	19.50
17	Geo. Meier & Co	Liquid bronze	1.25
19	Chas. D. Jenkins	Map rack	55.00
	Lucy H. Payne	Washing towels	10.63
	Geo. F. Muth & Co	Oil	1.60
	James B. Lambie	Iron plates	5.00
	Wm. H. Kaiser	Earthen jars	9.53
	Mackall Bros	Soap	1.20
	Lutz & Co	Horse blanket	6.00
	Wm. M. Galt & Co	Forage	12.37
	Leidy S. Depue	do	13.20
	J. Baumgarten & Sons	Rubber stamps	1.45
	Total second quarter		3,001.45
1901.			
Jan. 3	United States Express Co	Transportation	5.45
	do	do	1.10
	do	do	5.95
	American Ice Co	Ice	37.60
	W. G. Ducket	Arnica, etc	3.50
	Wyckoff, Seamans & Benedict	Repairs to typewriter	13.50
	Capital Traction Co	Car tickets	20.00
	J. T. Walker Sons	Lime	.75
	W. B. Moses & Sons	Stools	4.76
	do	Water cooler	6.50
	Jno. Moran	Wagon jack	6.00
	Church & Stephenson	Lumber	75.00
	Jas. B. Lambie	Gears	4.77
	do	Rope, etc	10.22
5	Tengwall File and Ledger Co	Transfer file	1.25
11	Lucy H. Payne	Washing towels	10.05
17	Houghton & Delano	Paper	.75
	Leidy S. Depue	Forage	15.70
	B. B. Earnshaw & Bro	Straw	3.87
	Jno. Moran	Repairing speaking tube	1.50
	S. J. Meeks's Sons	Repairing wagon	24.00
	Geo. F. Muth & Co	Kalsomine	1.37
	Jas. B. Lambie	Screw hooks	4.97
	do	Wire brushes	1.40
	do	Iron plates	3.50
	do	Shovels, etc	3.76
	do	Keys	4.50
	Albert Kahlert & Co	Repairing carpet	7.63

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

WEATHER BUREAU—CONTINGENT EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
Jan. 17	Wyckoff, Seamans & Benedict	Repairing typewriter	$1.16
	Jno. C. Parker	Disc seals	1.00
	----do	Paper	5.50
	W. B. Moses & Sons	Water-cooler stand	1.60
	----do	Linoleum	63.45
	----do	Window shades	31.96
	----do	Chair	5.00
	J. Baumgarten & Sons	Frames	2.50
	----do	Rubber stamps	3.90
	Adams Express Co	Transportation	7.05
29	Lutz & Co	Horse cover	4.00
	Capital Traction Co	Car tickets	20.00
	American Ice Co	Ice	14.83
	W. B. Moses & Sons	Window shades	4.40
	James B. Lambie	Pipe, solder, etc	2.19
	Jno. C. Parker	Washington Directories	15.00
Feb. 7	Clark & Davenport	Carpets, etc	281.90
	----do	Altering carpets	25.00
9	Albert Kahlert & Co	Cleaning carpets, etc	1.80
	Louis Hartig	Ice pads	35.00
	----do	Horseshoes	12.75
	N. Humphrey	Castors	3.57
	The Chesapeake and Potomac Telephone Co	Telephone rent	35.00
	----do	----do	20.00
	W. M. Galt & Co	Forage	12.37
	Woodward & Lothrop	Needles	1.20
	J. Baumgarten & Sons	Rubber stamps	2.00
	----do	----do	1.60
	Jno. C. Parker	Stamp box	2.00
	The Smith Premier Typewriter Co	Repairing typewriter	6.00
	Foote, Pierson & Co	Supplies for telegraph	7.50
18	Jno. C. Parker	Staple binders	7.20
	B. B. Earnshaw & Bro	Straw	8.17
	L. S. Depue	Oats	13.20
	Jas. B. Lambie	Nails	12.20
	Clark & Davenport	Rug fasteners	.75
	Smithsonian Institution	Transportation exchanges	152.21
	United States Express Co	----do	5.10
	----do	----do	3.50
23	Tengwall File and Ledger Co	File	1.88
	J. Baumgarten & Sons	Repairs to stamp	1.00
	Jas. B. Lambie	Wrenches	2.50
	Fred. A. Schmidt	Making charts	.70
	----do	Millimeter paper	2.40
26	Burrelle's Press Clipping Bureau	Press clippings	285.94
28	Lucy H. Payne	Washing towels	10.25
	Acme Repair and Bicycle Co	Repairs to bicycle	.50
Mar. 6	The Smith Premier Typewriter Co	Repairs to typewriter	2.00
	Capital Traction Co	Car tickets	20.00
	W. M. Galt & Co	Forage	12.37
	W. G. Duckett	Medicine for horses	4.70
	L. S. Depue	Forage	15.70
	American Ice Co	Ice	13.72
	W. B. Moses & Sons	Repairing chairs	13.85
	Rudolph, West & Co	Hinges, bolts, etc	6.63
	J. Baumgarten & Sons	Rubber stamps	2.86
12	Jas. B. Lambie	Dado plans, etc	3.20
	Clark & Davenport	Rug fasteners	4.50
	United States Express Co	Transportation	5.60
14	Burrelle's Press Clipping Bureau	Press clippings	40.84
	G. E. Stechert	Books	68.06
22	Ameritan Ice Co	Ice	11.68
	L. S. Depue	Oats	13.20
	The Chesapeake and Potomac Telephone Co	Moving telephone	1.80
	Lutz & Co	Horsewhips	4.00
	----do	Repairs to harness	3.75
26	The A. J. Joyce Carriage Co	Repairs to carriages	39.45
	W. B. Moses & Sons	Repairs to furniture, etc	2.75
30	Lucy H. Payne	Washing towels	10.50
	Total third quarter		1,718.64
Apr. 6	J. Baumgarten & Sons	Repairing dating stamps	1.25
	Capital Traction Co	Car tickets	20.00
	C. Becker	Harness dressing	1.50
	Wyckoff, Seamans & Benedict	Repairing typewriter	.70
	Geo. F. Muth & Co	Kalsomine	2.20
	Lutz & Co	Materials and repairing carriage, etc.	14.75
	----do	Repairs to harness	4.25

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

WEATHER BUREAU—CONTINGENT EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
Apr. 16	Albert Kahlert & Co	Repairs to carpet	$3.78
	W. M. Galt & Co	Forage	12.37
	B. B. Earnshaw & Bro	do	3.56
	Jas. B. Lambie	Door lock	.75
24	Louis Hartig	Horseshoe nails, etc	15.25
	Wyckoff, Seamans & Benedict	Repairs to typewriter	14.10
	Lutz & Co	Repairs to harness	.75
	do	Lap robe for carriage	22.50
	American Ice Co	Ice	15.50
	R. Carter Ballantyne	Rubber pads	3.75
May 2	Rudolph, West & Co	Lock	1.00
	Jno. C. Parker	Japanese paper	10.00
	W. B. Moses & Sons	Repairs to furniture	42.50
	The Chesapeake and Potomac Telephone Co	Telephone rent	20.00
	do	do	35.00
3	The Okonite Co	Copper wire	5.00
9	Capital Traction Co	Street-car tickets	20.00
	Jas. B. Lambie	Screws, bolts, etc	3.00
	Wm. G. Duckett	Horse medicine	7.50
13	Jno. Moran	Iron pan	3.00
	The Chesapeake and Potomac Telephone Co	Service	1.50
	The Smith Premier Typewriter Co	Repairs to typewriter	6.00
	L. S. Depue	Forage	30.55
	Adams Express Co	Transportation	12.81
	do	do	3.40
	do	do	11.30
	do	do	3.35
	do	do	6.51
	United States Express Co	do	6.91
	do	do	24.81
23	Adams Express Co	do	3.40
	Z. D. Gilman	Filtering tubes	12.00
	Church & Stephenson	Lumber	5.76
	American Ice Co	Ice	16.78
	W. M. Galt & Co	Forage	12.37
	B. B. Earnshaw & Bro	do	3.61
	do	do	3.52
	Geo. F. Muth & Co	Japan liquid	2.00
	Lutz & Co	Repairing harness	3.60
	James B. Lambie	Rope	2.94
25	Postmaster, Washington, D. C	Postage stamps	175.00
31	Burrelle's Press Clipping Bureau	Press clippings	11.46
	G. E. Stechert	Publications	113.65
	Lucy H. Payne	Washing towels	10.48
	do	do	10.56
June 1	The Maurice Joyce Engraving Co	Repairing engravings of electrotypes.	6.25
	Wyckoff, Seamans & Benedict	Repairing typewriter	2.55
	Jno. C. Parker	Tablet paper	1.35
11	Jas. K. Probey	Carriage pole	16.00
	Capital Traction Co	Car tickets	20.00
	M. Silverberg & Co	Glass frame for maps	5.50
	C. Becker	Hoof dressing	1.90
	Library Bureau	Cards	4.50
	L. S. Depue	Oats	13.20
	Geo. F. Muth & Co	Papers	1.08
	Chas. A. Ross	Photo negative	2.50
	Lutz & Co	Repairs to harness	2.50
18	American Ice Co	Ice	17.96
29	Lucy H. Payne	Washing towels	11.73
	Total fourth quarter		885.25
	Supplemental.		
July 1	L. S. Depue	Forage	13.20
	W. G. Duckett	Medicine for horses	1.50
	B. B. Earnshaw & Bro	Forage	5.80
	W. M. Galt & Co	Hay	8.34
2	National Rwy. Publishing Co	Railway guide	5.00
6	United States Express Co	Transportation	10.65
	J. Baumgarten & Sons	Rubber stamps	.40
	do	do	1.10
	J. E. Shaw	Repairs on bicycle	3.00
	S. J. Meeks' Sons	Spring clips	6.00
18	W. B. Moses & Sons	Awnings	38.02
	Lutz & Co	Harness	150.00
31	Lucy Payne	Washing towels	9.87
Aug. 6	The J. C. Ergood Co	Bell's Star cleaner	.84
	Library Bureau	Cards	6.88
22	Jno. Hanson	Repairing clocks	6.50

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

WEATHER BUREAU—CONTINGENT EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
Aug. 26	Smithsonian Institution	Transportation of exchanges	$102.56
Sept. 6	Carl Voelker	Advertising	1.65
	Daily Union Printing Co	do	3.00
13	The Chesapeake and Potomac Telephone Co.	Rent	20.00
	do	do	35.00
	Albert Kahlert & Co	Cleaning carpets, etc	15.33
	American Ice Co	Ice	22.88
23	The Marine Review Publishing Co	Marine Review	3.00
	Total		469.52

RECAPITULATION.

First quarter	$1,534.11
Second quarter	3,001.45
Third quarter	1,718.64
Fourth quarter	885.25
Supplemental	469.52
Total	7,608.97

WEATHER BUREAU—GENERAL EXPENSES.

Date.	Name.	Nature of payment.	Total.
1900.			
July 25	Willis L. Moore	Traveling expenses	$51.00
	Sophia A. Beuter	do	27.75
26	Orris W. Roberts	do	12.25
	W. T. Blythe	do	8.65
	A. J. Davis	do	13.50
	Harry B. Nichols	do	.75
31	W. F. R. Phillips et al	Salaries	277.90
	B. F. Larcombe et al	do	2,740.83
Aug. 2	Norman B. Conger	Traveling expenses	70.60
	Matt Borland	Shelving	5.00
	H. Rasmusson & Co	Chairs	6.00
	Wm. E. Donaldson	Traveling expenses	15.10
4	F. H. Brandenberg	Office expenses	28.50
	David R. Morris	Traveling expenses	10.15
	Ray C. Johnson	do	6.75
	O. O. Scott	Services	3.00
	E. D. Beattie	Printing monthly bulletins	36.00
	University of Tennessee	Electric arc lamps, etc	200.00
6	Geo. W. Felger	Traveling expenses	6.75
	F. G. Tingley	do	8.35
8	R. P. Clarke Co	Towels, etc	440.55
13	Julien P. Friez	Supplies for shipment	3,866.75
	W. H. Fallon	Traveling expenses	15.75
	Chas. A. Hyle	do	33.50
	Gideon S. Jones	do	7.25
	Alf. H. Thiessen	do	3.00
14	D. Frank Parker	Stationery	2,217.50
	John C. Parker	Neostyle printing frames	200.00
16	S. P. Johnson	10 caligraphs	697.50
17	J. W. Jordan & Co	Rollers	35.00
21	Crosby Transportation Co	Passenger transportation	3.00
	Young & Wooton	Awnings	7.00
	C. Berbusse	Repairing chairs	5.00
	King Hardware Co	Screw-drivers, etc	5.65
	Grambs Bros	Rubber hose	18.00
	The Globe Wernicke Co	Guides	34.03
	Denver Type Foundry Co	Staple case, etc	.90
	Treman King Co	Water cooler	3.50
	A. H. Sweet	Cleaning clock	1.00
	H. W. Slaughter	Cleaning office	5.00
	R. T. Butler	Painting instrument shelters	6.00
	J. J. Letson	Repairing instrument shelters	19.60
	J. O. Wheaton & Co	Frames	6.00
	Eureka Blotter Bath Co	Supplies	6.75
	Nusbaum Book and Art Co	Framing charts	6.23
	A. L. Davis	Water cooler	3.00
	H. C. Breeden Co	Office stools	6.50
	M. N. Hunt	Window glass, etc	2.35

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

WEATHER BUREAU—GENERAL EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
1900.			
Aug. 21	Edw. J. Smith	Repairs to register	$0.75
	K. R. Lau	Repairs to office roof	7.05
	G. Carlson	Services	2.00
	Davenport & Thacher	Window shades	1.50
	J. A. Faulkner	Cylinder	1.40
	Jno. Shoemaker	Services and material	1.00
	Edwd. Kilborn	do	4.00
	C. C. Smith	Repairing office furniture	35.00
	J. W. Welch	Repairing instrument shelter	2.50
	Jno. R. Wyss	Repairing office furniture	9.50
	Jno. Jordt	Shades	10.00
	M. J. Walsh	Installation of electric call bell	6.10
24	J. Baumgarten & Sons	Logotype outfits	689.62
25	The Post-Office Department	Maps	88.60
31	W. F. R. Phillips et al	Salaries	266.90
	B. F. Larcombe et al	do	2,686.49
Sept. 12	Willis L. Moore	Traveling expenses	39.00
15	Pay roll, New York, N. Y	Substation salaries	40.00
	Jno. C. Parker	Copying and desk pads	104.10
	do	Paper	1,145.85
	do	Stationery for shipment	767.33
	Jno. H. Carter	Repairing clock	3.00
	Henry Wood	Services	2.40
	Wm. Roche	Navy batteries	7.20
	Forsberg & Murray	Repairs to machinery	113.00
	J. R. Stephens	Crating file case, etc	5.00
	Elsie Roller Composition Co	Casting rollers	2.70
	The Ohio Moulding Manufacturing Co	Frames to charts	12.22
	Clark & Davenport	Carpets, making and lining	428.23
	R. P. Clarke Co	Sheeting, etc	74.65
	do	Cotton batting	12.60
	J. C. Entwistle	Engraving	7.50
	W. B. Moses & Sons	Water coolers, etc	8.64
	do	Furniture for shipment	480.80
	W. P. Fuller & Co	Mucilage, ink, etc	3.50
	A. R. Taylor & Co	Repairs to typewriter	1.50
	Wyckoff, Seamans & Benedict	do	2.25
	Richd. L. Lamb	Pads	137.75
	E. Morrison Paper Co	Paper	8.00
	The J. C. Ergood Co	Fly paper	3.20
	Geo. F. Muth & Co	Lanterns, lamps, etc	148.13
	Fred A. Schmidt	Milliographs, etc	196.70
	Z. D. Gilman	Bottles	3.75
	Standard Oil Co	Benzine	6.76
	The J. K. Gill Co	Dictionary	15.00
	F. H. Lovell & Co	Clocks	126.94
	Robt. L. Moore	Laying carpet	2.00
	H. H. Hill	Repairing river gauge	8.00
	Thayer & Jackson Stationery Co	Binding	21.50
	The City and Suburban Telephone Co	Telephone extension instrument.	5.00
	Henry Buckmann	Wood	40.00
	S. A. D. Keister	Ink and mucilage	3.25
	A. Fair Service Co	Oil, ink, and brooms	16.50
	Beig & Rood	Oil, ink, and mucilage	3.95
	A. M. Kaufman & Co	Ink	2.00
	Fred Albright	Wood, oil, etc	52.20
	Mack Wellman	Varnish paint	3.25
	Alabama Great Southern R. R. Co	Passenger transportation	4.30
	do	do	3.72
	Southern Rwy. Co	do	2.40
	Peoria, Decatur and Evansville Rwy. Co	do	11.40
	Crosby Transportation Co	do	2.75
	Narragansett Pier R. R. Co	do	7.42
	New York, New Haven and Hartford R. R. Co.	do	4.35
	Pennsylvania R. R. Co	do	63.99
	do	do	28.75
	Delaware, Lackawanna and Western R. R. Co.	do	6.07
	Boston and Maine R. R. Co	do	12.20
	Detroit and Mackinac Rwy. Co	do	7.14
	Adams Express Co	Transportation	25.29
	Wm. L. Beldin	Traveling expenses	11.25
	L. C. Cover	do	24.47
	Chas. A. Hyle	do	13.20
	D. A. Seeley	do	8.75
	T. F. Townsend	do	2.90
	Geo. M. Chappel	do	1.95
	Henry J. Cox	do	12.50

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

WEATHER BUREAU—GENERAL EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
1900.			
Sept. 15	Hugo Legler	Traveling expenses	$18.50
	Chas. B. Tuch	do	14.15
	Jas. Berry	do	3.00
	C. A. Mueller	do	11.50
	F. H. Brandenburg	do	23.90
	H. E. Wilkinson	do	28.05
	C. J. Doherty	do	5.25
	J. W. Smith	do	3.85
	Jno. R. Glenn	do	1.25
	R. A. Fessenden	Office expenses	27.25
	Frank W. Very	do	31.00
	Wm. E. Donaldson	do	5.00
	Jos. P. Bolton	do	20.50
	A. H. Thiessen	do	28.75
	J. W. Smith	do	4.90
	H. A. McNally	do	1.10
	N. B. Conger	Traveling expenses	12.75
	Jno. R. Weeks	do	20.50
	Geo. G. Harkness	do	6.50
	R. B. Harkness	do	11.25
	Jas. W. Tanner	Services	1.40
	Pay roll, Des Moines, Iowa	Substation salaries	3.60
	G. Carlson	Repairing instrument shelters	3.65
	D. F. Flood	Repairing rain gauges	4.00
	F. M. McKeough	Recasting rollers	3.00
	Julien P. Friez	Wind vane, etc., for shipment	1,884.50
	do	do	1,588.50
	A. L. Cook	Ink, etc	2.75
	The Globe Wernicke Co	Printed cards, etc	9.90
	Henry J. Cardy	Painting instrument	4.50
	The Smith-Premier Typewriter Co	Repairs to typewriters	2.00
	A. S. Hutchinson	Repairs to office chairs	1.00
	Economy Typewriter Supplies Co	Repairs to typewriters	5.00
	Wm. Aris	Services	5.00
	C. S. Braisted	Pencils, etc	70.31
	J. B. Shannon & Sons	Brass chair, etc	5.00
	W. N. Williams	Table	9.00
	M. J. Healy	Repairing instrument shelter	10.00
	E. J. Shattuck & Co	Printing ink	2.50
	Jno. F. McLean	Oil, ink, etc	9.00
	A. P. Ritz	Renovating carpet, etc	7.50
	D. P. Fisher	Painting instrument shelter	10.00
	R. E. Dann	Printing crop bulletins	12.50
	H. W. Norton	Rubber stamps	4.90
	H. George & Son	Repairs to office case	3.50
	McGraw & Co	Cleaning carpet, etc	12.29
	A. Jennings	Laying carpet	2.25
	Thayer & Jackson Stationery Co	Carbon paper	4.00
	The Stafford Drug Co	Oil, ink, etc	4.85
	L. R. Duke	Repairing instrument shelter	5.00
	Henry Haffner	Moving printing press, etc	37.00
	Cleveland Carpet Cleaning Co	Cleaning carpet	8.00
	Alex. H. Revell & Co	Shelves	5.25
	L. A. Cobb	Repairing clock	1.00
	E. A. Folsom	Repairing meteorological equipment.	5.25
	C. E. Johnson	Wood	24.00
	Patterson Transfer Co	Hauling	1.00
	E. Sephton	Building board walk	10.00
	W. H. Simpson	Painting instrument shelters	10.00
	Flint & Walling Manufacturing Co	Signal towers, etc	4,298.20
	Jno. H. Erb	Frames	31.20
	R. A. Williamson	Printing crop bulletins	17.50
	Jno. S. Pinney	Gothic type	5.40
	A. B. Bean & Co	Oil, etc	1.75
	R. B. Smith	Gasoline	.90
	Jas. R. Hobbs	Use of team	3.75
	W. W. Best	Repairing telegraph lines	2.25
	Wm. McGrath	Drayage	3.50
	Fort Smith and Van Buren Light and Transit Co.	Electric fan	25.00
	Pan Telephone Co	Rent of telephone	2.00
	J. W. Dayton	Wringer, etc., for copying	8.75
	J. Schimelpfering	Window curtains	7.00
	Erie Art Store	Frames	5.00
	Chamberlain & Taylor	Ink	7.00
	Harry C. Dougherty	Painting instrument shelter	20.00
	Edw. Hunter & Co	Laying carpet	5.00
	Claude L. Friel	Painting instrument shelter	13.75
	Geo. H. Godfrey	Laying carpet	1.92

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

WEATHER BUREAU—GENERAL EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
1900.			
Sept. 15	A. Osander & Sons	Painting instrument shelter	$9.00
	Julius Andrae & Sons Co	Services	2.00
	Price Bros	Painting instrument shelter	8.00
	Bennett Printing House	Printing crop bulletin	20.00
	Northwestern Fixture Co	Insulators	44.00
	W. H. Bonhart	Removing office, etc.	70.00
18	D. T. Maring	Traveling expenses	21.10
	H. E. Williams	do	23.45
	Edgar B. Calvert	do	46.87
	J. Warren Smith	do	3.95
	N. B. Conger	do	4.50
	A. H. Thiessen	Office expenses	31.00
	E. H. Emery	do	4.60
	R. A. Fessenden	do	31.00
	Frank W. Very	do	29.75
	Jas. E. Bell	Repairing wind vane, etc.	3.50
	do	Paint and brush	2.50
	C. E. Park	Erecting river gauge	10.00
	W. L. Lillie & Co	Framing charts	26.00
	Howald & Couldin	Repairs to chairs	3.75
	Key City Furniture Co	Repairs to glass cover	2.00
	W. A. Tunander	Repairs to river gauge	14.00
	Parker Bros	Repairs to chairs	1.50
	F. E. Warren Mercantile Co	1 stool	3.50
	Smith Premier Typewriter Co	Feed rollers	1.50
	Everhard Faber	Pencils, etc	579.30
	J. P. Nawrath	Twine	92.44
	The Okonite Co., Ltd	Copper wire	655.00
	Chas. E. Johnson Co	Duplicating ink, etc	835.00
	Walter Scott & Co	Stone bed, screws, etc	8.75
	O. J. Maigne	Rollers for printing office	42.28
	Mittag & Volger	Carbon paper	108.00
	Geo. Meier & Co	Lithograph varnish, etc	13.07
20	Standard Oil Co	Oil for printing office	28.97
	Mackall Bros	Glycerin	3.35
	Alabama and Georgia Long Distance Telephone Co.	Telephone service	20.20
	Alabama, Mississippi and Tennessee Telephone Co.	do	6.25
	Ohio River Telephone Line	do	5.00
	Corvallis and Eastern R. R. Co	Telegraph service	2.50
	Isle of Wight Telephone and Telegraph Co	do	4.40
	I. M. Powell	Services	14.00
	Fred. D. Larke, jr	do	6.77
	Chas. D. Reed	Traveling expenses	34.35
	Pay roll, New York, N. Y	Substation salaries	40.00
	Louisville and Nashville R. R. Co	Passenger transportation	2.89
	Louisville, Evansville and St. Louis Consolidated R. R. Co.	do	3.75
	Carters Ink Co	Ink	36.00
	Chesapeake Electric Co	Insulators, etc	46.89
	Jno. W. Stonebraker	Paper	428.00
	C. S. Braisted	Pencils	33.00
	Chadwick Copying-book Co	Letter copying books	214.00
	United States Envelope Co	Envelopes	19.60
	Jas. Fitzsimons & Co	Office furniture	90.00
	B. McAdam	Moving printing press	12.00
	The R. D. Willson Hardware Co	Hardware	10.15
	J. H. Cleveland	Frames for charts	11.25
	F. J. Hill	Benzine	1.50
	Tampa Electric Co	Electric fans	12.00
	Bieg & Rood	Copying sheets	.75
	Paul Kiene	Rubber stamps	1.00
	J. P. Nawrath	Sponges	16.50
	W. H. Hughs	Toilet set	3.00
	Robt. Owens	Services	2.50
	R. D. Willson	Stove, etc	18.10
	O. G. F. Markus	Repairs to wind vane	5.00
	Jno. Angelo	Painting board walk	5.00
	H. E. Bidwell	Painting river-gauge	9.00
	C. L. Byrd & Co	Repairing clock	1.00
	J. C. Sala	Repairing telethermograph	4.25
	Jas. Lyons	Replacing platform, etc	51.35
	E. H. Moorehouse & Co	Framing charts	40.00
	H. A. Sanders	do	16.90
	Z. D. Gilman	Sponges	2.75
	M. G. Copeland & Co	Pennants	1.95
	Rudolph, West & Co	Halyards	116.00
	R. N. Getty	Wire insulators	107.00
	E. D. Beattie	Printing crop bulletins	36.00

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

WEATHER BUREAU—GENERAL EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
1900.			
Sept. 20	R. E. Dann	Printing crop bulletins	$10.00
24	Reading Paper Mills	Paper	737.82
	S. S. Bassler	Office expenses	1.70
	A. H. Thiessen	do	16.74
	The Central District and Printing Telegraph Co.	Telegraph services	6.20
	Illinois Central R. R. Co	Passenger transportation	28.75
	Wyckoff, Seamans & Benedict	Repairing typewriters	12.30
25	C. J. Doherty	Office expenses	36.37
	Jas. H. Scarr	Traveling expenses	17.60
	W. W. Neifert	do	4.75
	Frank H. Bigelow	do	76.00
	Thos. Somerville & Sons	Lubricating compound	7.05
	J. E. Entwistle	Engraving	7.50
	Mackall Bros	Alcohol	12.67
30	B. F. Larcombe et al	Salaries	2,623.24
	W. F. R. Phillips et al	do	225.18
	First quarter		35,949.47
Oct. 1	Kenelin Cheseldine	Erecting mast	350.00
	Jno. Horne	Repairs to station	20.00
	E. B. Richards	Office expenses	64.60
	Philip Lindemyr	Gum, ink, etc	286.50
	Jno. C. Parker	Map paper, etc	139.67
	do	Supplies	3,467.94
	J. Baumgarten & Sons	Rubber stamps	7.56
	M. O'Leary	Sand	1.50
3	J. Edwd. Turton	Frames	747.50
	Broderick Bros	Rags	28.00
	Clark & Davenport	Carpets	467.79
	Jno. Moran	Mica	2.40
	Dulin & Martin Co	Glasses	12.60
	A. A. Wagner	Rain gauges	217.50
	R. P. Clarke Co	Millinet	2.38
	National Electric Supply Co	Knife switches	3.20
	Southern Rwy. Co	Passenger transportation	29.70
	Mackall Bros	Soap, etc	187.84
	do	Oil silk, etc	12.85
	do	Supplies	3.25
	J. C. Entwistle	Engraving	7.50
	Rudolph, West & Co	Shovels, etc	3.58
	do	Zinc	9.90
4	Michigan Central R. R. Co	Passenger transportation	1.30
	Atlantic Coast Line R. R. Co	do	38.40
	Grand Trunk R. R. System	do	34.73
	New York, New Haven and Hartford R. R. Co.	do	14.00
	St. Louis and San Francisco R. R. Co	do	9.05
	Smith Premier Typewriter Co	Repairs	7.00
	Brown & Borsheim	Repairing clock	2.50
	L. A. Overton	Repairing gauge	7.50
	C. R. Porter	Frames	28.60
	C. E. Johnson	Repairs to telegraph line	8.00
	Fred Albright	do	1.00
	H. W. Yarbrough	Frames	26.37
	Harry A. Neff	Repairs to furniture	3.00
	S. A. Freer	Painting shelter	6.00
	G. B. Cowing	Painting vane	5.00
	J. H. Kroeber	Services and material	7.70
	E. A. Slack	Printing bulletin	30.25
	Jno. N. Mitchell	Laying carpet	6.00
	A. C. McMillan	Erecting flagstaff	7.00
	E. D. Briggs	Surveying	10.00
	E. Arant	Services	4.80
	Wm. G. Williams	do	8.00
	Louis. H. Vogel	Repairing press	3.50
	Cumberland Presbyterian Publishing House.	Paper	2.10
	Roland Coffin	Repairing telegraph line	1.25
	Talbot & Hubbard	Repairing wind vane	10.00
	Flint & Walling Manufacturing Co	Erecting steel towers	162.97
	Gowan & Pickford	Saws, etc	24.80
	Henry Thorspeck	Repainting shelter	8.00
	The R. D. Willson Hardware Co	Heater, chairs, etc	11.75
	Jas. Heffernan	Water for station	3.00
	The Globe-Wernicke Co	File case	50.00
	W. G. Jones	Repairing instruments	4.50
	Edwd. H. Rose	Repairing telegraph line	1.25
	W. H. Panney	Recasting rollers	5.80

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

WEATHER BUREAU—GENERAL EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
1900.			
Oct. 4	Julius Audrae & Sons Co	Electric motor, etc	$80.25
	Geo. Draper	Oars and rowlocks	2.35
	Simon Nusbaum, postmaster	Rent post-office box	1.50
	John Heffernan	Ice	2.00
	Henry Rice & Son	Water cooler	6.50
	H. J. Conrad	Electrical work	8.00
	N. K. White	Repairing printing press	5.00
	H. Dunwoody	Laying carpet	5.60
	Compton Lumber Co	Lumber, etc	59.45
	J. R. Sanborn & Son	Carpet	53.00
	W. S. Fleenor	Oil	.65
	Claude L. Friel	Printing bulletins	11.00
	Robt. B. Nelson	Painting flagstaff	2.50
	Bryant & Douglas Book and Stationery Co	Ink	3.70
	Ambros Hagman	Repairing press	1.00
	C. Posey	Ice	6.18
	The Toby Furniture Co	Re-covering stand	8.00
	H. J. Wohlgemuth	Repairing telethermograph	2.50
	Wm. A. West	Telegraph poles	4.50
	D. Stormont	do	2.00
	Bennett Printing House	Printing crop bulletin	16.00
	Eimer & Amend	Centigraph	1.53
	do	Gold, bismuth, etc	36.96
	do	Paraffin, etc	15.93
	do	Sheet gold, etc	8.51
	E. D. Beattie	Printing bulletins	36.00
	Geo. Meier & Co	Lithograph varnish	8.75
	W. Broadwell	Services	4.00
	State Journal Co	Printing bulletins	31.20
	Sunset Photo Engraving Co	Halftone plate	33.12
	G. C. Fahlbusch	Repairing shelter	18.40
	Thayer & Jackson Stationery Co	Binding book	1.25
	Jas. Freeman	Laying cable	1.50
	Carter Ink Co	Ink	7.50
	David Cuthbertson	Traveling expenses	29.15
	E. H. Nimmo	Hauling supplies	1.00
	Clyde Lemon	do	4.25
	Allen Buell	Laying carpet	2.25
6	Jas. B. Lambie	Pliers, etc	14.70
	do	Brushes, etc	27.70
	do	Fallow and belt lacing	5.28
	do	Clippers, etc	86.38
	Broderick Bros	Rags	14.00
	M. Du Perow	Cells, etc	2,529 50
	Jno. C. Parker	Inkstands	1.34
	do	Paper	1,951.95
	R. P. Clarke Co	Felt	30.00
	The Maurice Joyce Engraving Co	Photo plates	101.65
	do	Electrotype plates	69.16
11	Collector of customs, Georgetown	Drayage on books	10.56
13	Rising Sun Telegraph Line	Telegraph service	5.20
	Jacksonville and St. Johns Bar Telegraph Line.	do	12.50
	Ocean Towboat Line	do	36.00
	Philadelphia, Reading and Pottsville Telegraph Co.	do	21.40
	Great Northwestern Telegraph Co	do	160.59
	Alabama, Mississippi and Tennessee Telephone Co.	Telephone service	6.75
	Ohio River Telephone Line	do	5.40
	Almo Telephone Co	do	1.47
	Corvallis and Eastern R. R. Co	Telegraph service	2.70
	Isle of Wight Telephone and Telegraph Co.	do	4.20
	George G. Harkness	Traveling expenses	4.25
	L. N. Jesunofsky	Drayage	1.50
	J. W. Bryan	Hauling	35.62
	W. H. Fallon	Drayage	2.75
	Geo. Hass Hagen	Hauling, etc	4.50
	Chas. Eneu Johnson & Co	Litho. ink	37.50
	do	Ink	18.75
	Edw. A. Beals	Cartage and express	2.65
	W. U. Simons	Transportation	3.00
	Yates & Co	Oil	2.15
	Altie M. Adie	Cleaning office	15.00
	H. T. Johnson	Rubber stamps	.90
	Carter, Rice & Co., Corporation	Paper	822.40
	A. H. Thiessen	Repairing shelter, etc	25.77
	Oliver L. Fassig	Express	2.15
	E. C. Thompson	Traveling expenses	.30
	do	do	.50

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

WEATHER BUREAU—GENERAL EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
1900.			
Oct. 13	W. T. Blythe	Gasoline, etc	$16.41
	M. E. Blystone	Express	1.10
	G. M. Wilson	Hauling	2.30
	Chicago Auditorium Association	Rent of office	450.00
16	L. M. Tarr	Shelves, etc	9.30
	J. W. Smith	Traveling expenses	1.85
	Jos. P. Fallihee	Horse hire	5.50
	Wm. G. Burns	Hauling, etc	2.75
	do	Traveling expenses	29.10
	do	do	26.90
	Reading Paper Mills	Paper	360.00
	M. J. Greer	Washing towels	1.50
	P. C. Snaw	do	6.00
	American Ice Co	Ice	3.90
	Baltimore Towel Supply Co	Washing towels	2.25
	American Linen Supply Co	do	3.00
	Rob Roy Coleman	Ice	4.60
	City Electric Light Co	Electric lights	4.50
	The Woodford Telephone Co	Rent of telephone	5.00
	Doster & McCurdy	Ice	32.50
	The American Toilet Supply Co	Towels, etc	2.25
	Grant Rivenburg	Ice	3.22
	Catherine Wilson	Rent of office	140.82
	Peoples' Gaslight and Coke Co	Gas	7.20
	Cleveland Telephone Co	Rent of telephone	18.00
	Iowa Telephone Co	do	13.50
	Raleigh Telephone Exchange	do	7.50
	The Northwestern Telephone Exchange Co.	do	18.00
	Chas. G. Le Clair	Ice	3.00
	American Ice Co	do	6.00
	M. T. Hayden	Washing towels	3.00
	Michigan Telephone Co	Telephone service	4.77
	E. A. Hughes	Electric light	9.00
	Omaha Towel Co	Washing towels	3.00
	Nebraska Telephone Co	Rent of telephone	15.00
	John W. Eagleson	Ice	7.50
	Excelsior Electric Co	Electric light	1.50
	The Silver State Towel Supply Co	Washing towels	2.25
	Thos. W. Pemberton	Electric light	5.10
	Board of Public Works	Water	3.50
	Lincoln Traction Co	Electric current	13.50
	Fort Smith and Van Buren Light and Transit Co	do	7.74
	Charleston Consolidated Rwy., Gas and Electric Co	do	3.00
	Nashville Laundry Co	Towel service	1.80
	The Blue Mountain Co	Ice	6.10
	H. L. Pittock	Electric current	18.00
	C. B. Little	Water	11.00
17	Balfe D. Johnson	Office rent	63.00
	Wm. Pollman	do	87.50
	Benj. M. Jacobs	do	30.00
	Peter Sonna	do	120.00
	Geo. L. Lovett	do	105.00
	F. E. Warren Mercantile Co	do	129.40
	Maggie French	do	59.20
	C. M. Beeson	do	88.91
	U. G. Myers	do	88.44
	do	do	49.46
	Mary C. Pratt, et al	do	93.75
	Elizabeth L. Renoe	do	100.00
	Farmers' National Bank of Fresno	do	115.00
	Indianapolis Gas Co	do	250.00
	R. McLaughlan	do	150.00
	Conrad National Bank	do	67.50
	Bunce & Iiams	do	90.00
	Tyree & Wilkins, agents	do	67.50
	A. W. Kennie	do	42.00
	The Gamble-Desmond Co	do	100.00
	The Citizens' Bank, Norfolk, Va	do	131.25
	Walla Walla Lodge	do	84.87
	H. Wallenberg	do	77.25
	Adam C. Rackliffe	do	75.00
	D. Horton	do	120.00
	E. H. Jamieson	do	135.00
	A. J. Knight	do	82.19
	Columbia Building Co	do	87.50
	E. P. Jones	do	25.00

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

WEATHER BUREAU—GENERAL EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
1900.			
Oct. 17	E. J. Davenport	Office rent	$25.00
	do	do	66.67
	Edgar Harding	do	87.50
	Ella W. Daniels	do	87.50
	H. H. Taylor, agent	do	322.50
	Guaranty Building Co	do	134.96
	O. I. Mairs	do	67.50
	Otto B. Hart	do	24.00
	Mill Valley and Mount Tamalpais Scenic Ry.	do	105.00
	T. M. Jeffris & Co	do	100.00
	H. Overholzer	do	127.50
	T. B. Catron	do	105.00
	Orson Adams, jr	do	120.00
	Real Estate and Law Building Co	do	43.75
	Albert Marty	do	165.00
	Pacific Club	do	67.50
	American Surety Co. of New York	do	625.00
	E. S. Hughes & Co	do	106.11
	B. S. Williams	do	55.00
	J. L. Manning	do	59.32
	Jas. K. Porter	do	150.00
	C. S. McLaury et al	do	69.00
	J. E. Dooly	do	150.00
	Warfield & Dann	do	75.00
	M. E. Conway	do	37.74
	Henry Bolton	do	52.84
	Portland Transit Co. of Oregon	do	210.00
	Northwestern Mutual Life Insurance Co	do	100.00
	Jas. S. Sebree	do	36.00
	Bank and Insurance Building Co	do	100.00
	Jas. L. Connell	do	75.00
	Luke & Smith	do	102.15
	Joseph Gussenhoven	do	90.00
	John G. Brown	do	75.00
	H. S. Gilbert	do	67.00
	W. D. Grant	do	225.00
	Society of Savings	do	285.00
	Kate F. Coke	do	60.00
	Jno. Seiner	do	114.00
	Margaret Parmentier	do	75.00
	H. W. Styron	do	38.62
	Pay roll, Parkersburg, W. Va	Substation, salaries	101.20
	Pay roll, New Haven, Conn	do	48.00
	Pay roll, Norfolk, Va	do	105.00
	Pay roll, Buffalo, N. Y	do	123.00
	Pay roll, Philadelphia, Pa	do	69.00
	Pay roll, Cincinnati, Ohio	do	195.00
	Pay roll, Shreveport, La	do	42.00
	Pay roll, New York, N. Y	do	40.00
	Pay roll, Vicksburg, Miss	do	78.00
	Pay roll, Charleston, S. C	do	168.00
	do	do	18.00
	Pay roll, Portland, Oreg	do	115.00
	Chas. A. Blumner	Services	15.00
	Kate O'Tool	do	4.50
	W. T. Turbeville	do	15.00
	B. F. Modisett	do	30.00
	J. Evans	do	9.00
	Jno. T. Myers	do	15.00
	N. W. Wagner	do	21.00
	E. J. Kalliher	do	15.00
18	Ray G. Lewis	Office rent	5.00
	Lorenzo Littlefield	do	64.99
	Cedar City Furniture Co	do	71.00
	Estate of Isaac Eberly	do	154.00
	Paine Bros	do	73.95
	First Ward Bank, Portland, Me	do	126.00
	Amarillo Improvement Co	do	30.00
	City of Palestine, Tex	do	78.50
	W. B. Moses & Sons	Desks, etc	258.48
	do	do	172.13
	do	do	784.60
	National Electric Supply Co	Copper wire	15.00
	Chesapeake and Potomac Telephone Co	Telephone service	3.10
	Geo. F. Muth & Co	Turpentine	52.26
	do	Wicks	1.35
	Hugh Reilly	Lights	.32
	J. C. Entwistle	Services	25.00
	Southern Printers' Supply Co	Printing type	35.57

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

WEATHER BUREAU—GENERAL EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
1900.			
Oct. 18	W. S. Jenks	Repairs to rain gauge	$4.00
	Jas. B. Lambie	Saws	37.08
	The J. C. Ergood Co	Flour	1.20
	Pay roll, Harrisburg, Pa	Substation salaries	42.00
	Pay roll, La Crosse, Wis	do	63.00
	Pay roll, Chicago, Ill	do	386.40
	Pay roll, Charleston, S. C	do	73.60
	Pay roll, Vicksburg, Miss	do	73.60
	Pay roll, Narragansett Pier, R. I	do	90.00
	Pay roll, Des Moines, Iowa	do	215.80
	Pay roll, Cairo, Ill	do	131.20
	Pay roll, Pittsburg, Pa	do	323.50
	Pay roll, Little Rock, Ark	do	42.00
	do	do	1.60
	Pay roll, Chattanooga, Tenn	do	142.80
	Pay roll, Omaha, Nebr	do	25.10
	Homer K. Plough	Services	15.00
	H. L. Holden	do	30.00
	Ed. Kendall	do	30.00
20	Fredk. Springmann	do	8.12
	Manhattan Electric Supply Co	Wire, etc	82.70
	Geo. Meier & Co	Scotch hones	12.60
	do	Ink	7.24
	Iowa Telephone Co	Telephone service	36.00
	La Crosse Telephone Co	do	7.50
	Wisconsin Telephone Co	do	3.75
	Lynchburg Telephone Co	do	3.00
	Southern Bell Telephone and Telegraph Co	do	3.00
	do	do	7.50
	Southern States Telephone Co	do	7.50
	Southern Bell Telephone and Telegraph Co	do	10.60
	E. A. Born	Electric current	6.00
	Indianapolis Light and Power Co	do	18.00
	Tampa Electric Co	do	5.00
	do	do	3.64
	C. W. Byrnes	Towel service	3.00
	Amelia McLean	do	3.00
	The Bell Telephone Co. of Philadelphia	Service	30.00
	Mill Valley and Mt. Tamalpais Scenic Rwy	Rent of office	15.00
	C. J. Oyler	do	4.50
	R. A. Williamson	Printing bulletins	28.00
	Flint & Walling Manufacturing Co	Platform, etc	10.95
	do	Railings	28.00
	Cumberland Telephone and Telegraph Co	Telephone service	12.00
	Vicksburg Rwy. Power and Manufacturing Co.	Electric current	9.00
	Buffalo Gas Co	Gas	7.50
	Southern Bell Telephone and Telegraph Co	Telephone service	13.50
	San Antonio Gas and Electric Co	Electric service	6.25
	M. A. Graham	Towel service	1.50
	Oregon Telephone and Telegraph Co	Telephone service	6.94
	Portland Gas Co	Gas	11.70
	R. C. Wariner	Toweling service	3.00
	R. E. Dann	Printing bulletins	10.00
	Cumberland Electric Light and Power Co	Electric current	15.00
	The Central District Printing Telegraph Co.	Telephone service	34.25
	Consumers' Ice Co	Ice	3.90
	C. C. Randolph	Printing bulletins	95.50
	P. Minor	Ice	12.40
	Michigan Telephone Co	Telephone service	6.00
	The Inland Telephone and Telegraph Co	do	9.00
	Southwestern Telephone and Telegraph Co.	do	9.00
	Sunset Telephone and Telegraph Co	do	6.00
	Cumberland Telephone and Telegraph Co	do	14.00
	Missouri and Kansas Telephone Co	do	18.00
	Pennsylvania Telephone Co	do	20.00
	The South New England Telephone Co	do	27.00
	Ontario Telephone Co	do	7.50
	The Empire State Telephone and Telegraph Co.	do	15.00
	The Bell Telephone Co. of Buffalo	do	12.50
	Santa Fe Electric Telephone Co	do	6.00
	Citizens' Telephone Co	do	6.00
	The City and Suburban Telephone Assn	do	21.00
	Capital Telephone and Telegraph Co	do	4.50
	The Colorado Telephone Co	do	13.50
	Union Telephone Co	do	5.00
	New England Telephone and Telegraph Co.	do	9.00

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

WEATHER BUREAU—GENERAL EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
1900.			
Oct. 20	Black Hills Telephone and Telegraph Co	Telephone service	$21.00
	Rocky Mountain Telephone Co	do	10.50
	Delaware and Atlantic Telephone and Telegraph Co.	do	12.00
	Southern Bell Telephone and Telegraph Co.	do	15.00
	Southwestern Telephone and Telegraph Co.	do	15.00
	Southwestern Telephone and Telegraph Co	do	15.00
	Chesapeake and Potomac Telephone Co	do	31.25
	Columbia Telephone Co	do	10.50
	Oregon Telephone and Telegraph Co	do	22.50
	Missouri and Kansas Telephone Co	do	30.00
	Sunset Telephone and Telegraph Co	do	15.00
	Interstate Telephone and Telegraph Co	do	4.50
	Southern Bell Telephone and Telegraph Co	do	4.50
	Hudson River Telephone Co	do	16.50
	The Colorado Telephone Co	do	22.50
	Rocky Mountain Bell Telephone Co	do	8.25
	Southern Bell Telephone and Telegraph Co	do	7.50
	The Bell Telephone Co. of Missouri	do	16.25
	Southern Bell Telephone and Telegraph Co	do	10.00
	New York and Pennsylvania Telephone and Telegraph Co.	do	21.00
	Wisconsin Telephone Co	do	18.00
	New England Telephone and Telegraph Co	do	14.25
	People's Telephone and Telegraph Co	do	7.50
	East Tennessee Telephone Co	do	9.00
	Michigan Telephone Co	do	4.50
	East Tennessee Telephone Co	do	9.00
	Columbia Telephone Co	do	6.00
	Southern Bell Telephone and Telegraph Co	do	10.32
	Northwestern Telephone Exchange Co	do	9.00
	Missouri and Kansas Telephone Co	do	9.00
22	Geo. H. Orr	Services	15.00
	Thos. A. Boon	do	30.00
	C. P. Disney	do	21.00
	Pay roll, Portland, Me	Substation salaries	75.00
	Pay roll, Augusta, Ga	do	30.00
	Pay roll, New Orleans, La	do	84.00
	Pay roll, Raleigh, N. C.	do	97.00
	Pay roll, Mobile, Ala	do	81.00
	Pay roll, Montgomery, Ala	do	49.00
	Pay roll, Indianapolis, Ind	do	180.60
	Pay roll, Nashville, Tenn	do	49.80
	Pay roll, Savannah, Ga	do	183.60
	Pay roll, Atlanta, Ga	do	164.00
	Pay roll, Montgomery, Ala	do	128.80
	Pay roll, Kansas City, Mo	do	297.40
	Pay roll, Memphis, Tenn	do	220.80
	Pay roll, Omaha, Nebr	do	220.80
25	Chas. M. Moore	Services	2.00
	U. V. Hendrix	do	21.00
	L. M. Tarr	Traveling expenses	1.20
	G. J. O'Connor	do	4.25
	W. S. Belden	Repairing rain gauge, etc	6.20
	E. Whitehurst	Services	12.00
	Alex. G. Burns	Cartage	2.50
	Jno. Feist	Bookcase	25.00
	Western Union Telegraph Co	Repairs telegraph line	11.67
	Dodge City Telephone Co	Telepone service	3.00
	Jas. Hepburn	Services	105.00
	Nashville Gas Co	Gas	10.80
	Electric Lighting Co	Electric service	.75
	Alpena Electric Light Co	Electric current	6.00
	Minneapolis International Electric Co	do	15.00
	The Raleigh Electric Co	do	4.50
	J. F. Beck	Towel service	3.00
	Claude L. Friel	Printing bulletins	11.00
	Kentucky Steam Laundry	Towel service	1.50
	T. B. Satterwhite & Co	Ice	4.55
	Jno. Longstaff	Printing bulletins	35.00
	A. Midgett	Ice	9.20
	Geo. W. Finch	Telephone service	6.00
	The First National Bank of Moorhead	Office rent	66.31
	Geo. E. Shaw	do	70.00
	H. B. Boyer	Drayage	.50
	Geo. E. Franklin	Towel service, etc	3.35
	L. Rogers	Service	15.00
	J. W. Branan	do	15.00

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

WEATHER BUREAU—GENERAL EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
1900.			
Oct. 25	M. M. Laidley	Service	$21.00
	Meridian Telephone Co	Telephone service	6.00
	Geo. S. Waite	Office rent	119.82
	Tacoma Chamber of Commerce and Board of Trade.	do	60.00
	Fanny L. Keating	do	90.00
	Chamber of Commerce Building Co	do	93.21
	Guaranty Building Co	Electric lights	2.70
	P. F. P. Mueller	Service	35.00
	Postal Telegraph Cable Co. of Texas	Telegraph service	23.86
	H. C. Roberts Electric Supply Co	Insulators	32.70
	The Pain Manufacturing Co	Signal pockets	67.40
	Kansas City, Pittsburg and Gulf R. R. Co	Passenger transportation	18.85
	C. F. R. Wappenhaus	Benzine, etc	3.30
	Fanny McLandlass	Services	6.00
	D. W. King	do	3.75
	St. Louis, Keokuk and Northwestern R. R. Co.	Passenger transportation	42.50
	Inland Type Foundry	Type	61.00
	Reading Paper Mills	Paper	72.00
	The Lake Shore and Michigan Southern Rwy. Co.	Passenger transportation	67.70
	Phillip Lindmeyr	Cardboard	71.95
	Wm. Branigan	Use of team	9.00
	Pay roll, Savannah, Ga	Substation salary	63.47
	Pay roll, Minneapolis, Minn	do	340.40
	Pay roll, Wilmington, N. C	do	128.80
	Pay roll, Pensacola, Fla	do	36.00
	Southwestern Telegraph and Telephone Co.	Telephone service	7.00
	New York and Pennsylvania Telephone and Telegraph Co.	do	6.75
	Marcus Sanchez	Cleaning office	15.00
	Bennett Printing House	Printing bulletins	20.00
	Duluth Telephone Co	Telephone service	12.50
	Wyckoff, Seamans & Benedict	Repairing typewriter	7.71
	Hersee & Co	Repairing furniture	22.00
	E. H. Bochner	Repairing typewriter	8.00
	Rees Bresee	do	4.50
	Buffalo Typewriter Exchange	do	15.00
	Chicago Telephone Co	Telephone service	57.50
	Addressograph Co	Type, etc	4.92
	Alabama and Georgia Long Distance Telephone Co.	Telephone service	22.10
	Wm. J. Dombrowsky	Cleaning clock	1.00
	Richmond, Fredericksburg and Potomac R. R. Co.	Passenger transportation	3.50
	Jas. G. Biddle	Copper wire, etc	43.54
	Horace G. Whitney	Printing bulletins	27.50
	C. Posey	Ice, etc	13.30
	E. H. Rose	Repairing telegraph line	1.25
	Chicago, Burlington and Quincy R. R. Co	Telegraph service	5.41
	Minneapolis, St. Paul and Sault Ste. Marie Rwy. Co.	do	13.74
	Aurora and Friendship Telephone Line	Telephone service	10.40
	Universal Supply Co	Ink	10.00
26	Pay roll, Wilmington, N. C	Substation salaries	72.00
	Pay roll, Sandusky, Ohio	do	45.00
	Pay roll, Chicago, Ill	do	1,060.32
	Pay roll, Mobile, Ala	do	143.60
	Cincinnati, New Orleans and Texas Pacific Rwy. Co.	Passenger transportation	7.70
	W. M. Fulton	Ice, etc	20.70
	Frank W. Very	Meals and lodgings	30.00
	Wm. J. Olds	Repairing rain gauge	1.75
	R. A. Fessenden	Meals, etc	29.50
	Zetta Higgins	Services	30.00
	Frank L. McClintic	Traveling expenses	20.25
	W. M. Fulton	do	8.20
	T. S. Outram	do	.85
	J. W. Smith	do	1.35
	Chas. D. Reed	do	11.20
	Michigan Telephone Co	Telephone service	6.00
	do	do	6.00
	Sunset Telephone and Telegraph Co	do	6.00
	do	do	15.00
	East Tennessee Telephone Co	do	10.50
	Electric Railway and Manufactures Supply Co.	Dynamo brushes	2.50
	Central Union Telephone Co	Telephone service	10.50

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

WEATHER BUREAU—GENERAL EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
1900.			
Oct. 26	Central Union Telephone Co	Telephone service	$40.50
	The Northwestern Telephone Exchange Co.	do	18.00
	do	do	9.00
	Cumberland Telephone and Telegraph Co.	do	21.00
	do	do	30.00
	do	do	10.00
	Southern Bell Telephone and Telegraph Co.	do	8.25
	do	do	17.00
	United Electric Light and Power Co	Electric current	24.00
	Peninsular Light and Power Co	Electric wire	8.50
	do	Electric current	3.37
	Standard Gas and Electric Co	Gas	14.80
	Inland Telephone and Telegraph Co	Telephone service	18.00
	New York Telephone Co	do	60.00
	R. L. Lewis	do	15.75
	The Telephone Co. of South Jersey	do	3.33
	New Orleans Gas Light Co	Gas	35.72
	E. Schmaltz	Cleaning office	1.50
	M. N. Weber	Services	7.00
	S. L. Thompson	Lumber, etc	6.12
	Geo. Gobel	Flagstaff	75.00
	Oklahoma Furniture Co	Laying carpet	3.60
	Mary Fantleroy	Towel service	.75
	Davie Brothers	Repairing shelters, etc	6.00
	H. Brooker & Co	Kerosene, etc	2.63
	C. H. Reynolds	Repairing clock	1.00
	R. U. Getty	Ink, etc	8.50
	A. Greenwood & Co	Painting shelter	11.00
	American Type Founders' Co	Reglets, etc	2.79
	P. H. Cheney & Son	Electric current	5.62
	Diamond Ice and Storage Co	Ice	5.60
	Henry J. Ledoux	Water	7.14
	Jones & Powell	Ice	2.34
	R. E. Dann	Printing bulletins	5.00
	Statesman Printing Co	do	101.50
	R. H. Vorpahl	Casting rollers	5.10
	Scholes & Raehford	Erecting wind vane	12.50
	E. A. Little	Cleaning office	1.65
	Gether & Drebert Co	Type, etc	6.85
	Levi H. Campbell	Service and material	9.75
	Griggs, Land & Co	Coal	92.08
	The Friedenwald Co	Paper	2,063.80
	Geo. M. Hubinger	Towel service	2.00
	J. H. Thiemeyer	Boxes	101.20
	Schneder Bros	Services	47.50
	Louis Florman	Chart frames	15.00
	J. W. Dodd	Printing bulletins	1.83
	do	do	23.16
	J. I. Lengsfield	do	30.80
	A. A. Boles	Services	9.50
	Jno. A. Roebling's Sons Co	Copper wire	181.16
	Jno. R. Ayers	Typewriter ribbon	.75
	Gamble & Ludwig	Printing material	1.40
	Chas. E. Johnson & Co	Ink	57.50
	G. E. Stechert	Book	12.19
	W. R. Nifong	Ice	1.60
	Dent & Butler	Office rent	70.00
	Geo. F. Strong	Drayage	3.00
	C. H. Phelps	Map frames	22.36
	California Truck Co	Drayage	1.50
	McCrary & Branson	Chart frames	26.00
	M. O. Reilly	Repairing motor	3.50
	Gilpin & Jacobs	Stove	22.50
	O. J. Glenn	Drayage	2.85
	Richd. H. Blunt	do	1.50
	Kenelin Cheseldine	Services	24.00
	W. H. H. Smith	Use horse, etc	11.00
	do	Repairing telegraph line	60.00
	do	Services	.75
30	United States Express Co	Transportation	25.41
	J. C. Entwistle	Engraving	7.50
	Rudolph, West & Co	Halyards, hose, etc	26.30
	do	Supplies	551.34
	do	do	8.76
	do	do	10.96
	Union Typewriter and Supply Co	Repairing typewriter	4.75
	R. Carter Ballantyne	Pencils, bands, etc	24.60
	do	Paper	356.43

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

WEATHER BUREAU—GENERAL EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
1900.			
Oct. 30	R. Carter Ballantyne	Stationery	$446.48
	Wm. Ballantyne & Sons	Solio paper	71.00
	Mackall Bros	Vaseline	4.00
	Wm. H. Dyer	Sawdust	1.75
	Jno. Moran	Repairing lantern	1.50
	Thos. Somerville & Sons	Wrenches, etc	2.34
	do	Supplies	8.64
	do	Iron pipe	12.73
	Fred. A. Schmidt	Supplies	2.81
	Willis L. Moore	Traveling expenses	29.75
31	P. Connor	Office expenses	.25
	B. F. Lacombe et al	Salaries	2,847.82
	W. F. R. Phillips et al	do	277.90
Nov. 2	Jas. Berry	Traveling expenses	61.75
	N. B. Conger	do	85.66
3	L. A. Judkins	Office expenses	16.50
	L. M. Pindell	do	8.00
	J. H. Smith	do	5.50
	L. A. Judkins	do	.50
	Eliz. L. Renoe	do	3.00
	H. R. Patrick	do	.76
	A. H. Thiessen	Traveling expenses	6.65
	Pay roll, New Orleans, La	Substation, salaries	146.40
	do	do	220.00
	Pay roll, Augusta, Ga	do	165.60
	Pay roll, Boston, Mass	do	40.00
	Mary E. Shelden	Rent of office	74.60
	Frank D. Miracle	do	105.00
	Chicago, Milwaukee and St. Paul Rwy. Co	Passenger transportation	8.00
	American Type Founders' Co	Supplies	49.86
	do	do	33.46
	do	do	90.25
	do	do	64.77
	Chicago Varnish Co	Varnish	2.10
	Shissler-Chase Co	Frames for chart	18.72
	A. M. Smith & Co	do	4.25
	S. Leslie Thompson	Labor	2.00
	Phillip Gross Hardware Co	Hand truck	7.50
	W. W. Best	Repairing telegraph line	1.50
	H. G. Hart	do	2.00
	Robt. N. Meeks	Repairing flagstaff	2.00
	Fred Albright	Hire of horse	2.00
	Peleg Brown	Hire of team and driver	3.00
	A. J. Sanders	Cleaning river gauge	3.00
	L. F. Willoughby	Recasting rollers	4.10
	Riggs & Bro	Repairs to telethermograph	3.00
	W. M. Warren	Painting instrument shelter	5.00
	T. H. Lawrence	do	18.00
	E. L. Styron	do	10.00
	H. Van Kenren	Repairing river gauge	6.00
	Edison Sault Electric Co	Electric current	8.48
	American Electrical Works	Magnet wire	6.46
	Barnhart Bros. & Spindler	Supplies	41.71
	do	do	25.05
	L. Naegele & Sons	Printing bulletins	22.50
	Dora Moyen	Washing towels and flags	6.00
	Chas. H. Rowland	Ice	3.00
	Geo. Meier & Co	Flannel for printing office	23.40
	O. J. Maigne	Recasting rollers	16.80
	Julien P. Freiz	Services	10.00
	W. S. Jones	Painting river gauge	15.00
	A. E. Schnieder & Co	Framing charts	9.00
	Rocky Mountain Bell Telephone Co	Rent of telephone	9.00
	Pacific States Telephone and Telegraph Co	do	25.50
	Valley Paper Co	Paper for printing office	380.10
	O. J. Mairs	Hauling	1.00
	Addressograph Co	Boxes	10.00
	J. W. Selby	Lumber	2.36
	St. Paul Electric Co	Glass battery jars	1.00
	Lee A. Laird	Services	9.00
	Eldredge's Express	do	40.00
	Standard Oil Co	Benzine	6.76
	Jas. Hunter	Wood	48.00
	Cumberland Presbyterian Publishing House.	Paper	1.32
	Wm. F. Coston	Signals	17.10
	Peter Gray	Lanterns	290.00
7	W. G. Burns	Office expenses	39.75
8	Henry Hedenreich	Repairs to letterpress stand	7.00
	Hart & Parker	Field glasses	14.00

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

WEATHER BUREAU—GENERAL EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
1900			
Nov. 8	Chas. E. Johnson & Co	Lithograph ink, etc	$25.00
	Barnhart Bros. & Spindler	Services	1.50
	do	Supplies	9.07
	J. W. Mitchell	Frames for charts	19.50
	Port Royal Dock Co	Coal	90.00
	H. C. Thompson	Repairing instrument shelters	25.00
	Julien P. Friez	Supplies	454.60
	Jos. Bryan	Office rent	150.00
	G. N. Salisbury	Office expenses	2.00
	L. H. Murdoch	do	6.10
	J. P. Slaughter	do	.85
	Marsden Wright	do	4.75
	T. S. Outram	do	2.25
	W. M. Wilson	do	5.15
	Wayland Bailey	do	1.90
	A. E. Hackett	do	2.40
	Alfred H. Thiessen	do	29.50
	W. L. Day	do	3.10
	Alfred H. Thiessen	do	20.42
	W. T. Blythe	Traveling expenses	37.40
	Edwd. A. Beals	do	75.05
12	Wm. E. Dewitt & Co	Services	30.00
14	Pay roll, Atlanta, Ga	Substation salaries	57.00
	Pay roll, Fort Smith, Ark	do	39.00
	Pay roll, Columbus, Ohio	do	255.60
	Pay roll, Portland, Oreg	do	7.00
	Pay roll, St. Louis, Mo	do	184.00
	do	do	107.50
	D. D. Booze	Services	1.50
19	C. H. Moffett	do	1.50
	Thos. W. Smith	Signaling mast	554.00
	Norwich University	Electric light	12.00
	Max Levy	Electric current	30.00
	Alex. J. Pollock	Repairing clock	2.50
	M. Beckwith	Carting	.85
	H. R. Sadler	Repairing furniture	24.50
	Thos. McCaffrey	River gauge	40.00
	C. J. McRae	Coal	1.00
	Clarke & Courts	Stereotyping weather maps	2.50
	The State Co	Binding book of forms	1.50
	A. Greenwood & Co	Molding	6.50
	Worthington Bros	Erecting storm tower	35.00
	The Winship Manufacturing Co	do	34.00
	E. Olsen & Co	do	98.00
	The Phillips & Osborn C. C. and W. Works	Laying carpet	4.50
	Jno. McCallum	Erecting storm tower	86.00
	American Type Founders' Co	Type	13.07
	Barnhart Bros. & Spindler	Type, etc	40.02
	Henry J. Greene	Thermometers	900.00
	A. B. Wood	Washing towels	3.00
	E. D. Beattie	Printing climate and crop reports.	36.00
	Dunn & Lemmon	do	33.00
	The Bryan Printing Co	do	56.00
	Times-Journal Publishing Co	do	19.50
	E. M. Bowman	Drayage	3.25
	Pacific Transfer Co	do	14.00
	The Pigott & French Co	Printing crop report, etc	35.00
	Samuels Transfer and Storage Co	Drayage	2.50
	W. Broadwell	do	5.00
	Northern Pacific Rwy. Co	Passenger transportation	35.00
	Winton Telegraph Co	Telegraph service	7.60
	Corvallis and Eastern R. R. Co	do	2.40
	The Central District and Printing Telegraph Co.	do	12.20
	Southwestern Telegraph and Telephone Co	Telephone services	12.00
	Rocky Mountain Bell Telephone Co	do	5.03
	Ohio River Telephone Line	do	4.80
	Nebraska Telephone Co	do	46.18
	Jacksonville and Rich Square Telephone Co.	do	30.40
	Iowa Telephone Co	do	7.80
	East Tennessee Telephone Co	do	15.60
	Dakota Central Telephone Lines	do	107.65
	Cumberland Telephone and Telegraph Co	do	146.70
	Jno. Clarke	do	.10
	Alabama, Mississippi and Tennessee Telephone Co.	do	6.00
	Galveston Gas Co	Gas	3.00
	Hoke Engraving Plate Co	Supplies	73.70

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

WEATHER BUREAU—GENERAL EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
1900.			
Nov. 19	Hoke Engraving Plate Co	Recoating plates	$100.00
	do	Stereotype metal	32.60
	do	Recoating plates	100.00
	do	do	75.00
	do	do	100.00
	do	do	62.50
	Chas. W. Ling	Office expenses	2.50
	E. H. Emery	do	8.60
	do	do	10.00
	I. M. Cline	do	1.80
	R. G. Allen	do	12.50
	S. S. Bassler	Traveling expenses	11.50
	N. B. Conger	do	2.45
	Pay roll, Alpena, Mich	Substation salaries	60.00
	Pay roll, Cleveland, Ohio	do	66.45
	Pay roll, New Orleans, La	do	67.50
	Pay roll, Boston, Mass	do	500.25
	Saml. B. Hicks et al	Rent of office	120.00
	E. S. Levy	do	150.00
	J. P. H. Bell	Services	16.40
20	H. E. Craven	do	2.00
	T. P. Halloran	do	.50
	Pay roll, New York, N. Y	Substation salaries	40.00
	Pay roll, Charleston, S. C	do	35.00
	Pay roll, New Orleans, La	do	74.40
	Pay roll, Wilmington, N. C	do	43.40
	Pay roll, Atlanta, Ga	do	54.40
	Pay roll, Charleston, S. C	do	24.80
	Pay roll, Vicksburg, Miss	do	24.80
21	Pay roll, Galveston, Tex	do	404.80
	Pay roll, Louisville, Ky	do	274.60
	R. A. Fessenden	Office expenses	18.00
	A. H. Thiessen	do	22.25
	East Louisiana R. R. Co	Telegraph services	7.50
	Barron County Telephone Co	Telephone services	15.00
	Isle of Wight Telephone and Telegraph Co.	do	5.00
	Alabama and Georgia Long Distance Telephone Co.	do	21.00
	Staunton Mutual Telephone Co	do	37.50
	North Montana Telephone Co	do	21.90
	Cumberland Telephone and Telegraph Co.	do	22.10
	W. H. Holmes	do	6.00
	J. W. Lowry	Services	15.00
	T. Haggerty	do	48.00
	American Ice Co	Ice	1.35
	The Robt. Clarke Co	Ink	.85
	J. B. Buck	Galley rack	10.00
	F. I. Carter	Repairs to Caligraph	4.00
	Alex H. Revell & Co	Repairs to lounge	10.00
	C. L. Friel	Printing bulletins	13.75
	H. J. Bool	Frames for charts	17.00
	B. J. Tuttle	Painting instrument shelters	10.00
	Adolph Reich	Erection of tower	30.00
	Whitehead & Kales	do	100.15
22	Pay roll, Little Rock, Ark	Substation salaries	264.20
	Pay roll, Montgomery, Ala	do	43.40
	Pay roll, Savannah, Ga	do	68.20
	Pay roll, New Orleans, La	do	49.60
	Conrad E. Hesse	Office expenses	13.25
	Jos. P. Fallihee	do	3.00
	E. A. Evans	do	4.00
	Chas. M. Strong	do	3.85
	E. C. Vose	do	10.75
	Chas. E. Holmes	Traveling expenses	17.95
	R. A. Fessenden	do	25.30
	do	do	15.50
	Johnson & Johnson	Wood and coal	19.60
	M. R. Scarborough	Painting river gauge	2.00
	J. L. Hastings	Painting flagstaff	15.00
	C. Posey	Ice	6.80
	W. L. Thompson	do	6.00
	Addressograph Co	Supplies	1,512.25
	Kansas Farmer Co	Printing bulletins	30.00
	C. W. Richardson	Carpet, etc	22.75
	U. B. Dodge	Repairing telegraph	24.00
	Rising Sun Telegraph Line	Telegraph service	2.40
	Southwestern Telegraph and Telephone Co.	Telephone service	.70
	Mutual Telephone Co	do	7.50
	N. R. Fitzhugh, jr	Erecting storm tower	49.50

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

WEATHER BUREAU—GENERAL EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
1900.			
Nov. 22	H. W. Johnston	Erecting storm tower	$25.00
	S. W. Shearer	do	50.00
	Jno. Halloran	do	85.00
	N. R. Fitzhugh, jr	Erecting wind vane	16.50
	H. W. Gross	do	10.00
	Otto Redeker	Erecting instrument shelter, etc.	19.75
	Josef Stainer	do	32.00
23	C. E. Hesse	Traveling expenses	4.05
	Chesapeake and Ohio Rwy. Co	Passenger transportation	3.85
	The New York, New Haven and Hartford R. R. Co.	do	8.75
	Union Pacific R. R. Co.	do	43.25
	Michigan Central R. R. Co	do	8.37
	Pennsylvania Co	do	63.50
	Seaboard Air Line Rwy. Co	do	29.55
	New York Central and Hudson River R. R. Co.	do	5.39
	Fremont, Elkhorn and Missouri Valley R. R. Co.	do	9.10
	San Antonio and Aransas Pass Rwy. Co	do	35.95
	Schneider Bros	Testing tube	65.00
	J. H. Weddington & Co	Handsaw, etc	3.25
	J. H. Bunnell & Co	Relays	20.70
	Valley Paper Co	Paper	418.20
	Phillip Lindemeyr	Cardboard	17.99
	J. H. Thiemeyer	Packing boxes	126.75
	Walter Scott & Co	Repairing lithograph press	75.70
	do	Screws, etc	6.00
	Southern Bell Telephone and Telegraph Co.	Telephone service	7.50
	Cumberland Telephone and Telegraph Co.	do	25.18
	S. P. Johnson	Caligraph	69.75
	do	do	69.75
	Broderick Bros	Rags	14.00
	Rudolph, West & Co	Pitchers	4.98
	Thos. Somerville & Sons	Supplies	4.63
	Jno. C. Parker	Inkstands	28.80
	do	Paper	617.21
	M. G. Copeland & Co	Flags	2,158.22
	Clark & Davenport	Carpet	94.70
	J. Baumgarten & Sons	Rubber stamps	1.40
	W. B. Moses & Sons	Chair	5.00
	do	Furniture	133.40
	Mackall Bros	Soap	43.26
	The Maurice Joyce Engraving Co	Services and supplies	14.77
	do	Supplies	.75
	Wyckoff, Seamans & Benedict	Repairing typewriter	.60
	Jas. B. Lambie	Turn-buckles	3.00
	do	Wire, etc	1.95
	M. Du Perow	Glass cells	22.00
	Fred A. Schmidt	Ink, etc	122.72
	J. G. Puddock	Erection of tower	55.00
	Sentenne & Green	Signs for tower	112.50
	Jim Ray	Ice	10.00
26	Jno. C. Parker	Paper folders	16.96
	do	Clip boards	7.92
	J. C. Entwistle	Engraving	7.50
	Springmann's Express	Drayage	1.50
	Broderick Bros	Rags	14.00
	Cleveland Abbe	Traveling expenses	6.00
30	Geo. W. Eddey	Office expenses	1.25
	A. J. Mitchell	do	5.45
	L. N. Jesunofsky	Traveling expenses	5.70
	J. P. Friez	Rain gauges, etc	250.50
	Weber & Archer Machine Works	Repairs on press	4.00
	Glass & Prudhommie	Binding bulletins	51.50
	The Paine Manufacturing Co	Signal rockets	20.60
	F. L. Crindiff	Repainting instrument shelters	8.00
	F. A. Tasker	do	9.75
	Henry Haffner	Services	190.60
	M. E. Leeds	Static transformer	182.00
	American Electrical Works	Copper wire	4.59
	Norfolk and Southern R. R. Co	Passenger transportation	1.45
	do	do	1.40
	Union Pacific R. R. Co	do	18.00
	Pennsylvania R. R. Co	do	28.55
	The Colorado and Southern Rwy. Co	do	12.00
	Norfolk and Southern R. R. Co	do	1.00
	B. F. Larcombe et al	Salaries	2,791.24

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

WEATHER BUREAU—GENERAL EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
1900.			
Nov. 30	W. F. R. Phillips et al	Salaries	$269.20
Dec. 3	Clark & Davenport	Brussels carpet, etc	64.28
	do	do	103.39
	Jno. C. Parker	Paper	305.00
	do	do	1,333.20
	R. Carter Ballantyne	Pencils	73.90
	W. B. Moses & Sons	Bookcase	8.50
	Jas. B. Lambie	Nail pullers, etc	17.72
	Union Typewriter and Supplies Co	Pads	18.00
	Thos. Somerville & Sons	Nippers	1.08
	Rudolph, West & Co	Scissors	18.00
	Harry E. Overstreet	Hauling	.12
	J. R. Clark	Transportation	1.00
	Michigan Central R. R. Co	do	1.02
	Lake Shore and Michigan Southern Rwy. Co.	do	.58
	Southern R. R. Co	Passenger transportation	14.75
	do	do	6.66
4	Southern Bell Telephone Co	Telephone service	8.71
	Pay roll, Jacksonville, Fla	Substation salaries	90.00
	Pay roll, Galveston, Tex	do	136.40
	Pay roll, Memphis, Tenn	do	74.40
	H. W. Richardson	Office expenses	.75
	R. B. Harkness	do	.95
	A. H. Thiessen	do	20.73
	R. A. Fessenden	Traveling expenses	11.55
	N. B. Conger	do	47.75
	do	do	5.60
	Northern Pacific Rwy. Co	Passenger transportation	7.20
	New York, New Haven and Hartford R. R. Co.	do	5.20
	Great Northern Rwy. Co	do	2.90
	Atlantic Coast Line R. R. Co	do	7.05
	Newport and Wickford R. R. and Steamboat Co.	do	4.50
	Pennsylvania R. R. Co	do	36.67
	New Bedford, Marthas Vineyard and Nantucket Steamboat Co.	do	1.75
	Utah and Pacific R. R. Co	do	4.00
	A. W. Stevens	Drayage	1.50
	Thos. B. Meeker	do	1.75
	Howard Transfer Co	do	2.75
	E. L. Page	do	1.50
	Manistee Iron Works Co	Storm tower	48.00
	Fred. F. Smith	Casting	.75
	J. H. Baltz	do	1.00
	Georgetown Iron Works	Erecting storm tower	60.00
	N. E. Noakes & Bro	do	55.00
	Henry M. Smith	do	45.00
	Saml. Bally	do	83.75
	Optenberg & Souneman	do	90.00
	T. J. Reynolds	Services	15.00
	C. J. Kettleson	do	10.00
	Wm. Crawford	Use horse and wagon	3.00
	Addressograph Co	Supplies	4.49
	M. O. Reilly	Services, etc	9.64
	C. E. Johnson & Co	Magnesia	6.00
	Eberhard Faber	Pencils, etc	131.28
	A. J. Cameron	Field glasses	12.00
	The Blakeley Printing Co	Type	4.50
	Rhodes & Buckner	Repairing office case	9.00
	Geo. Magub	Repairing office desk	5.00
	The H. & W. B. Drew Co	Molding for rooms, etc	11.32
	C. E. Hoyle & Sons	Making frames	24.70
	Boyd Park	Clock springs	2.00
	Wild & Stevens	Recasting rollers	3.25
	G. B. Cowing	Renovating office	14.00
	J. B. Marbury	Office expenses	25.50
	Harry Stackhouse	Repairing chairs	2.15
	Dowd & King	Tubing, etc	1.20
	Barnhart Bros. & Spindler	Type, rule	20.49
	A. T. Sprague	Chestnut logs, etc	20.00
	Edenfield & Jetton	File case	45.25
	Jacob Grumbinger	Repairing clock	1.50
	The Okonite Co., Limited	Wire	15.00
	United States Envelope Co	Envelopes	1,729.35
	F. H. Knowles	Services	5.00
	Lucy A. Midgett	do	13.50
	A. D. Dixon	do	13.50
	F. C. Ayers	do	1.25

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

WEATHER BUREAU—GENERAL EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
1900.			
Dec. 4	Adolphus Burrus	Services	$3.75
	O. W. Bye	Use of horse	3.00
	The Denver Type Foundry Co	Repairs to printing press	12.00
	Wyckoff, Seamans & Benedict	Repairs to typewriter	2.20
	American Type Founders' Co	Supplies	45.89
	do	do	7.73
	do	do	1.15
10	Clark & Davenport	Carpet	36.37
	Fred A. Schmidt	Supplies	250.00
	J. C. Entwistle	Engraving	5.00
	Union Typewriter and Supplies Co	Platen	2.00
	Norfolk and Washington Steamboat Co	Passenger transportation	3.00
	W. L. Moore	Traveling expenses	38.00
	Lower Coast Packets	Transportation	.50
	J. H. Cunningham	do	.25
	Hoke Engraving Plate Co	Recoating plates	87.50
11	Eimer & Amend	Gold in sheets	2.21
	Geo. Meier & Co	Lithographic varnish	8.75
	J. B. Miner	Material and labor	64.00
	American Type Founders' Co	Leads	5.75
	Hudgins & Hurst	Mail bag	2.00
	N. B. Bennett	Painting instrument shelters	8.00
	Jno. W. Holmes	Repairing telegraph lines	3.00
	Queen & Co., incorporated	Electric coil	175.00
	Georgetown Electric Co	Electric light on tower	14.00
	Fort Smith and Van Buren Light and Transit Co.	Electric current for fan	4.00
	G. B. Wilson & Co	Erecting river gauge	117.75
	D. Stormont	Erecting storm tower	71.00
	A. M. Blythe	do	234.00
	A. D. Ross	do	40.00
	Peter Dixon	do	170.00
	Wm. H. Wyer & Co	do	65.00
	United States Envelope Co	Envelopes	3.85
	Valley Paper Co	Paper	130.00
	Yreka R. R. Co	Passenger transportation	1.00
	Maricopa and Phoenix and Salt River Valley R. R. Co.	do	2.10
	Pacific Coast Steamship Co	do	50.00
	J. P. Fallihee	Office expenses	4.50
	Jas. S. Sebree	do	13.60
	American Type Founders' Co	Supplies	26.94
14	J. E. Smith	Repairing telegraph line	4.00
	H. G. Hart	do	2.00
	Fred. Albright	Use of horse	3.00
	Hyrum Dalley	Drayage	1.75
	Geo. F. Muth & Co	Turpentine	26.52
	R. C. Ballantyne	Files	20.60
	Jno. C. Parker	Letter presses, etc	82.65
	Erick Boysen	Hauling	.50
	Eagle Iron Works	Erecting storm tower	117.76
	Morris E. Leeds & Co	Wire	3.07
	Seth Graham & Son	Drayage	2.60
	R. E. Carrington	Stovepipe	1.00
	J. Baumgarten & Sons	Rubber stamps	1.05
	The Maurice Joyce Engraving Co	Electrotype plates	28.12
	do	Services	1.50
	W. B. Moses & Sons	Office furniture	156.60
	do	do	33.25
	Hedderich Bros. & Co	Brooms, etc	2.00
	Wm. H. Dyer	Sawdust	1.75
	Franklin & Co	Eyeglasses	4.80
	Rudolph, West & Co	Chamois skin	25.00
	C. Paravicini	Repairing instrument case	7.00
	W. Branigan	Use team	5.00
	Buffington & Co	Re-covering rollers	3.80
	Postal Telegraph Cable Co	Telegraph services	258.65
	do	do	71.40
	Pay roll, Mobile, Ala	Substation salaries	47.80
	Fredk. Springmann	Transportation	5.68
	The Pacific Coast Co	Passenger transportation	1.00
	Jno. R. Weeks	Office expenses	3.35
	J. C. Hayden	do	.50
	W. G. Burns	do	44.62
	Frank W. Very	do	17.00
	W. M. Fulton	Traveling expenses	6.60
	do	do	8.00
	W. B. Stockman	do	38.62
	L. N. Murdock	do	6.00
	W. S. Belden	do	8.80

Expenditures of Department of Agriculture for year ending June 30; 1901—Cont'd.

WEATHER BUREAU—GENERAL EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
1900.			
Dec. 17	Pay roll, New York, N. Y.	Substation salaries	$40.00
	Bank of Tehama County	Office rent	99.06
	A. H. Thiessen	Office expenses	20.00
	R. A. Fessenden	do	23.75
	Conrad E. Hesse	do	20.00
	Alex. G. McAdie	Traveling expenses	102.25
	Aurora and Friendship Telephone Line	Telephone service	4.80
	The Bell Telephone Co. of Buffalo	do	.55
	Ohio River R. R. Co	Telegraph service	7.80
	International Ocean Telegraph Co	do	121.18
	do	do	125.51
	Jacksonville and St. Johns Bar Telegraph Line.	do	7.50
	do	do	7.50
	Ocean Tow Boat Line	do	30.00
	do	do	30.00
	Postal Telegraph Cable Co. of Texas	do	42.27
	Great Northwestern Telegraph Co	do	160.55
	J. T. Harper	do	10.32
	Philadelphia, Reading and Pottsville Telegraph Co.	do	21.18
	A. T. Craig	Services and material	1.90
	Allie M. Adie	do	5.00
	H. E. Paddock	do	1.75
	M. N. Hunt	do	3.30
	The Carter Ink Co	Mucilage cups	14.00
	W. A. Powell	Repairing typewriter	13.55
	D. Stormont	Transportation	5.00
	East Florida Printing Co	Printing weather bulletins	39.00
	Hart & Parker	Repairs to office clock	2.80
	The Smith Premier Typewriter Co	Repairs to typewriter	13.70
	R. Schiller	Services	3.75
	E. D. Beattie	Printing climate bulletins	36.00
	Wm. A. West	Poles for telegraph line	782.00
	E. J. Brooks	Ink	3.60
	L. H. Jones	Recasting rollers	3.05
	Inland Type Foundry	Supplies	4.07
	Jno. R. Nye	Office furniture	29.00
	Barnhart Bros. & Spindler	Type	12.44
	do	Lye brushes	17.10
	Thos. B. Meeker	Erecting flagstaff	70.00
18	W. H. Howard	Services	30.00
	W. H. T. Spencer	do	101.65
	E. Sephton	Shelving	27.00
	Chippewa Hardware Co	Red lead	2.00
	Emmett & Wheeler	Labor and materials	3.10
	E. P. Kinney	Laying cable and making wire points.	9.50
	W. W. Armstrong	Gaspipe	3.00
	Geo. Beesley	Papering and painting	9.00
	The Van Bibber Roller Co	Casting rollers	4.00
	The Friedenwald Co	Tissue paper	32.00
	F. S. Hartwell	Welsbach droplight	4.95
	Dent & Butler	Window shades	3.50
	McGilvery & Boston	do	3.50
	Yates & Co	Benzine	1.00
	Hager Bros. Co., Limited	Mirror	1.75
	Wolfe & Co	Repairing furniture	21.25
	E. L. Davant	Repairing typewriter	5.00
	Jas. Markey	Labor and material	3.25
	A. B. Pittman	do	4.00
	Geo. G. Palmer	Erecting storm tower	49.00
	E. B. Henderson	do	275.00
	Wm. H. Butler	do	40.00
	A. H. Freeman	do	90.00
	W. H. Feldmeyer	do	35.00
	Quigg & Penfield	do	40.00
	Wm. R. Hallam	do	54.50
	Minneapolis, St. Paul and Sault Ste. Marie Rwy. Co.	Telegraph services	15.88
	Chesterfield Telephone and Telegraph Co	do	7.60
	The Central District and Printing Telegraph Co.	do	6.20
	Rising Sun Telegraph Line	do	2.70
	Corvallis and Eastern R. R. Co	do	2.70
	Chicago, Burlington and Quincy R. R. Co	do	2.56
	Put-in-Bay Telegraph Co	do	9.63
	Minneapolis, St. Paul and Sault Ste. Marie Rwy. Co.	do	9.75
	East Louisiana R. R. Co	do	2.50

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

WEATHER BUREAU—GENERAL EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
1900.			
Dec. 18	The Kelly Island and Sandusky Cable Co.	Telegraph services	$9.30
	H. E. Wadsworth	do	41.80
	Alabama and Georgia Long Distance Telephone Co.	Telephone service	23.90
	Ohio River Telephone Line	do	5.40
	Eastern Telephone Line	do	.20
	Southwestern Telegraph and Telephone Co.	Telephone rent	3.00
	Patterson Transfer Co	Hauling	1.00
	Nashville, Chattanooga and St. Louis Rwy. Co.	Passenger transportation	8.60
	Cleveland, Cincinnati, Chicago and St. Louis Rwy. Co.	do	22.00
	St. Louis and San Francisco R. R. Co	do	29.10
	Savannah, Florida and Western Rwy. Co	do	10.50
	Seaboard Air Line Rwy. Co	do	20.60
	F. H. Brandenburg	Office expenses	2.95
	W. T. Turbeville	do	1.00
	Carl S. Weatherwax	Services	10.00
	Chas. E. Smith	do	100.00
	M. J. Wright, jr	Traveling expenses	28.45
	Patck. F. Lyons	do	21.58
	Pay roll, Galveston, Tex	Substation salaries	30.00
	E. S. Levy	Office rent	100.00
19	Jas. F. Woodworth	Erecting storm tower	50.00
	J. A. Barnes	Coal	112.50
	B. P. Clapp Ammonia Co	Anhydrous ammonia	13.50
	Houghton & Delano	Supplies	4.98
	M. G. Copeland	Pennants	3.90
	J. Baumgarten & Sons	Rubber stamps	8.95
	R. B. Clarke Co	Millinet	.87
	J. C. Entwistle	Engraving	7.50
	R. C. Ballantyne	Waste basket	16.12
	Flint & Walling Manufacturing Co	Sill plates, etc	5.40
	Hoke Engraving Plate Co	Recoating plates	77.25
	do	do	37.50
	do	do	87.50
	do	Stereotype metal	33.40
	do	do	42.67
	A. E. Drinkwater	Repairs to telegraph lines	5.00
	American Type Founders' Co	Steel gauge pins	6.84
	Chas. E. Johnson Co	Lithographic ink	75.00
	Universal Supply Co	Printing	110.00
	Barnhart Bros. & Spindler	Type	1.69
	do	do	25.73
	J. W. Holmes	Repairing telegraph lines	3.00
	Alfred Smith	Cordwood	7.00
	Bendernagle & Co	Recasting rollers	1.50
	Union Photo Engraving Co	Tone plates	18.90
	G. F. O. Marklins	Removing wire cable	5.00
	F. M. McKeough	Recasting rollers, etc	4.00
	Santa Fe, Prescot and Phoenix Rwy. Co	Passenger transportation	73.00
	The Manistee and North Eastern R. R. Co.	do	1.61
	W. G. Burns	Traveling expenses	28.30
	Postal Telegraph Cable Co	Telegraph service	.20
	do	do	278.31
20	Ray C. Johnson	Traveling expenses	13.60
	Norman B. Conger	do	4.50
	do	do	6.50
	H. McP. Baldwin	do	6.40
	C. P. Cronk	Office expenses	8.25
	Chesapeake and Ohio Rwy. Co	Passenger transportation	39.20
	Lake Shore and Michigan Southern Rwy. Co	do	11.00
	Louisville and Nashville R. R. Co	do	12.40
	Pennsylvania Co	do	17.50
	Pittsburg, Cincinnati, Chicago and St. Louis Rwy. Co.	do	21.10
	Wabash R. R. Co	Transportation	.56
	Steamer Lafourche	do	.50
	Virginia and Truckee R. R. Co	do	3.23
	Lower coasts packets	do	.50
	Missouri Pacific Rwy. Co	do	.86
	Vandalia Line	do	.37
	New Bedford, Marthas Vineyard and Nantucket Steamboat Co.	do	1.86
31	W. F. R. Phillips et al	Salaries	277.90
	B. F. Larcombe et al	do	2,747.95
	Total second quarter		76,884.16

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

WEATHER BUREAU—GENERAL EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
Jan. 3	Michael O'Leary	Sand	$1.50
	W. B. Moses & Sons	Furniture	48.95
	do	do	93.25
	Geo. F. Muth & Co	Oil	8.56
	S. P. Johnson	Typewriter	69.75
	R. C. Ballantyne	Paper	53.75
	Jas. B. Lambie	Belt lacing	.98
	do	Brass rods, etc	5.98
	M. Du Perow	Oil	3.60
	Louis Hartig	Tacks	4.75
	Southern Rwy. Co	Passenger transportation	74.70
	United States Express Co	Transportation	53.46
	do	do	28.08
	do	do	20.66
	Norfolk and Southern R. R. Co	do	2.07
	Cleveland, Cincinnati, Chicago and St. Louis Rwy. Co.	do	2.21
	Burlington and Missouri River R. R. in Nebraska.	do	16.71
	Richmond, Fredericksburg and Potomac R. R. Co.	Transportation	.26
	Pennsylvania R. R. Co	do	.85
	Harry Overstreet	do	.36
	Star Union Line	do	.51
	do	do	.56
4	Delaware, Lackawanna and Western R. R.	Passenger transportation	4.07
	Flint & Walling Manufacturing Co	Steel signal towers	256.32
	Henry J. Green	Services	1.50
	Merrill Stevens Engraving Co	do	14.08
	Frank Golart, jr	do	3.00
	Wm. Roche	Navy cells	14.40
	C. C. Fagan	Erecting storm tower	28.00
	The Muzzy-Lyon Co	Repairs to scroll-saw belt	1.00
	Chas. Cummings	Services	6.00
	Yates & Co	Oil	1.90
	Wm. Prufrock	Repairing instrument stand	7.50
	F. L. Ewing	Renovating office	29.75
	Weston Electrical Instrument Co	Weston relay	25.00
	Fred. M. Locke	Insulators, etc	7.60
	E. F. Sanguinette	Painting instrument shelters	25.00
	L. H. Kurtz	Sash cord	1.22
	Thos. J. Tillett	Oil	3.00
	Jno. Cooper	Cleaning carpet, etc	6.80
	Claude L. Friel	Printing climate report, etc	11.00
	Wm. D. Lewis	Erecting storm tower	35.00
	W. E. Robinson	do	40.00
	W. M. Hinson	Gasoline	1.00
	Emil Tietgen	Erection of storm tower	65.00
	Hibben-Hill Boiler Works	do	68.00
	D. B. Bancroft	Repairs to clock	2.50
5	Albert Brand	Office expenses	29.10
	J. C. Piercy	do	1.35
	C. P. Cronk	do	61.00
	J. P. Fallihee	do	2.50
	H. K. Holcomb	do	1.25
	Jas. Kenealy	Traveling expenses	3.45
	W. T. Blythe	do	10.55
	H. C. Bate	do	3.00
	H. B. Boyer	do	5.43
	R. A. Fessenden	do	21.75
	do	do	9.30
	M. E. Blystone	do	7.75
	Jno. J. Games	do	5.55
	Chas. A. Blummer	Services	15.00
	J. W. Branan	do	15.00
	Barnhart Bros. & Spindler	Supplies	4.44
	E. S. Beardsley	Ink, etc	3.50
	Chas. A. Kimball	Erecting storm warning signals	70.00
	C. B. Brown & Co	Copper wire	5.75
	C. H. Turner	Gas stove	4.00
	Jno. C. Castor	Services	15.00
	Frank Golart, jr	Repairing telegraph lines	2.00
	Western Union Telegraph Co	do	4.30
	The Bell Telephone Co. of Buffalo, N. Y	Telephone rent	12.50
	Telegraph Co. of South Jersey	do	5.00
	The Southwestern Telegraph and Telephone Co.	do	9.00
	Pennsylvania Telephone Co	do	20.00
	La Crosse Telephone Co	do	7.50
	Wisconsin Telephone Co	do	3.75

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

WEATHER BUREAU—GENERAL EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
Jan. 5	The Pacific States Telephone and Telegraph Co.	Telephone service	$3.60
	Southern Bell Telephone and Telegraph Co	do	3.00
	Lynchburg Telephone Co	do	3.00
	The South New England Telephone Co	do	27.00
	Ontario Telephone Co	do	7.50
	The Empire State Telephone and Telegraph Co.	do	15.00
	The Bell Telephone Co. of Philadelphia	do	30.00
	South Bell Telephone and Telegraph Co	do	10.00
	The Northwestern Telephone Exchange Co.	do	9.00
	Sunset Telephone and Telegraph Co	do	6.00
	Pay roll, Sandusky, Ohio	Substation salaries	37.26
	Pay roll, Alpena, Mich	do	49.68
	Pay roll, New Haven, Conn	do	48.00
	Pay roll, Philadelphia, Pa	do	69.00
	Boston and Albany R. R. Co	Passenger transportation	3.76
	Baltimore and Ohio R. R. Co	do	32.95
	Michigan Central R. R. Co	do	5.01
	Chicago Auditorium Association	Office rent	450.00
	Prudential Building Co	do	89.98
	Guarantee Building Co	do	44.99
	The Citizens' Bank of Norfolk	do	131.25
	Ella W. Daniels	do	87.50
	E. J. Davenport	do	100.00
	E. P. Jones	do	25.00
	A. J. Knight	do	82.19
	E. H. Jamieson	do	135.00
	A. C. Rackliffe	do	75.00
	Walla Walla Lodge, No. 56, I. O. O. F	do	84.87
	Syree & Wilkins, agents	do	67.50
	Dent & Butler	do	105.00
	Conrad National Bank	do	67.50
	R. McLaughlin	do	150.00
	The Indianapolis Gas Co	do	250.00
	The Farmers' National Bank of Fresno	do	115.00
	Elizabeth L. Renoe	do	100.00
	Mary C. Pratt et al	do	93.75
	Ulysses G. Myers	do	175.00
	C. M. Beeson	do	88.91
	Maggie French	do	59.20
	Geo. L. Lovett	do	105.00
	Benj. M Jacobs	do	30.00
	Wm. Pollman	do	87.50
	B. D. Johnson	do	63.00
7	Warfield & Dann	do	75.00
	Mill Valley and Mount Tamalpais Scenic Rwy.	do	105.00
	H. H. Taylor, agent	do	322.50
	Columbia Building Co	do	87.50
	Geo. Edwd. Shaw	do	70.00
	Jas. L. Connell	do	118.75
	H. Overholzer	do	127.50
	Pacific Club	do	67.50
	Orson Adams, jr	do	120.00
	Ray G. Lewis	do	5.00
	Lorenzo Littlefield	do	64.99
	Real Estate and Law Building Co	do	43.75
	E. S. Huges & Co	do	106.11
	T. M. Jeffres & Co	do	100.00
	Sam B. and Anne E. Hicks	do	120.00
	O. J. Maris	do	67.50
	T. B. Catron	do	105.00
	Peter Sonna	do	120.00
	Jno. E. Dooley	do	150.00
	H. Wollenberg, administrator	do	77.25
	The Gamble-Desmond	do	100.00
	A. W. Kennie	do	42.00
	F. E. Warren Mercantile Co	do	129.40
	School District, Fort Smith, Ark	do	20.00
	Bunce & Iiams	do	90.00
	Edgar Harding	do	87.50
	D. Horton	do	120.00
	Rocky Mountain Bell Telephone Co	Telephone rent	10.50
	do	Telephone service	8.25
	The International Telephone and Telegraph Co.	Telephone rent	9.00
	Cumberland Telephone and Telegraph Co.	Telephone service	16.50
	Southwestern Telegraph and Telephone Co	Telephone rent	15.00

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

WEATHER BUREAU—GENERAL EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
Jan. 7	Southwestern Telegraph and Telephone Co	Telephone rent	$15.00
	Michigan Telephone Co	do	6.00
	do	do	2.50
	Citizens' Telephone Co	do	6.00
	Pacific States Telephone and Telegraph Co	Telephone service	25.50
	The Bell Telephone Co., of Buffalo	do	9.00
	Missouri and Kansas Telephone Co	do	18.00
	Dodge City Telephone Co	do	3.00
	Santa Fe Electric Telephone Co	do	6.00
	Missouri and Kansas Telephone Co	do	3.00
	E. D. Beattie	Printing bulletins	36.00
	Jacob Weltmer	Office supplies	6.40
	C. W. Byrnes	Washing towels	3.00
	Amelia McLean	do	3.00
	M. J. Greer	do	1.50
	The J. F. W. Dorman Co	Clasps	17.00
	Eagle Ironworks	Erecting storm tower	71.46
	Alabama Iron Works	do	212.00
	Barnhart Bros. & Spindler	Type	7.65
	Hannibal and St. Joseph R. R. Co	Passenger transportation	8.50
	Hoke Engraving Plate Co	Recoating plates	62.50
	American Type Founders Co	Supplies for printing office	17.65
	W. H. Adams	Repairing telegraph lines	2.00
	Ira W. Appleton	do	2.00
	Portage Lake Hardware Co., Limited	Snow shovels, etc	1.10
	Jas. Hunter	Drayage	2.00
	Geo. Draper	Oil	8.25
	Seligman Bros	Window shades	17.50
	do	Carpet	80.00
	Simon Nusbaum, postmaster	Rent of post-office box	1.50
	Rosenthal & Rubin	Picture molding	5.44
	Thos. E. Hines	Coal, wood, oil	56.37
	George Meier & Co	Gum arabic	2.20
	A. B. Pittman	Services	10.00
	Jas. Gibbons	do	8.00
	A. L. Osborn	Remodeling map frames	6.00
	J. H. Myers	Shelving	18.00
	W. M. McConahay	Cleaning clock	2.50
	E. W. Christensen	Moving office	15.50
	Grant Rivenburg	Ice	3.22
	Union Ice Co	do	18.40
	Tampa Electric Co	Electric light	5.00
	San Antonio Gas and Electric Co	Electric current	6.25
	Menomonee Electric Light, Railway and Power Co.	Electric light	3.50
	Ashland Light, Power and Street Railway Co.	do	5.00
	Indianapolis Light and Power Co	Electric power	18.00
	E. A. Born	Electricity	6.00
	A. Hamacek	Electric light	5.00
	E. A. Hughes	Lamps and droplight	7.00
9	Western Union Telegraph Co	Telegraph service	13,540.66
11	Richd. A. Shaw	Cleaning weather maps	5.00
	Martha Carter	do	5.00
	Wm. B. Stockman	Office expenses	46.50
	Geo. Cumberland	Dressing gaff of signal mast, etc	15.00
16	Walter Scott & Co	Repairing lithographic press	64.20
	Barnhart Bros. & Spindler	Brass rule	26.25
	Chas. E. Motley	Support for lanterns	2.00
	Banner Laundering Co	Washing towels	6.00
	The American Toilet Supply Co	do	2.25
	M. A. Graham	do	1.50
	Mary Fantleroy	do	1.50
	R. C. Warinner	do	3.00
	P. C. Shaw	Clean towel supply	6.00
	Baltimore Towel Supply Co	Washing towels	2.25
	J. F. Beck	do	3.00
	The Woodford Telephone Co	Telephone service	5.00
	New England Telephone and Telegraph Co	do	9.00
	Central Union Telephone Co	do	40.50
	Pacific States Telephone and Telegraph Co	do	22.50
	do	do	7.50
	Black Hills Telegraph and Telephone Co	do	21.00
	Interstate Telephone and Telegraph Co	do	4.50
	Central Union Telephone Co	do	10.50
	The Central District and Printing Telegraph Co.	do	34.25
	The Colorado Telephone Co	do	13.50
	Chicago Telephone Co	do	57.50

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

WEATHER BUREAU—GENERAL EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
Jan. 16	Delaware and Atlantic Telegraph and Telephone Co.	Telephone service	$12.00
	New York and Pennsylvania Telegraph and Telephone Co.	do	21.00
	Cumberland Telephone and Telegraph Co.	do	10.00
	do	do	30.00
	do	do	12.00
	The City and Surburban Telegraph Co	do	21.00
	Southwestern Telegraph and Telephone Co.	do	9.00
	New York Telephone Co	do	60.00
	Southern States Telephone Co	do	7.50
	Southern Bell Telephone and Telegraph Co.	do	20.00
	do	do	13.50
	do	do	15.00
	do	do	4.50
	Iowa Telephone Co	do	36.00
	Columbia Telephone Co	do	10.50
	Michigan Telephone Co	do	34.50
	do	do	4.50
	F. L. Keating	Office rent	90.00
	Jno. Semer	do	114.00
	Margt. Parmentier	do	75.00
	Union Trust Building Co., Limited	do	55.83
	do	do	229.17
	Henry Bolton	do	52.84
	C. L. McLaury et al	do	69.00
	Jno. G. Brown	do	75.00
	Adam Geiger	do	37.33
	B. S. Williams	do	26.67
	do	do	24.33
	W. D. Grant	do	225.00
	Portland Trust Co. of Oregon	do	210.00
	J. L. Manning	do	59.32
	American Surety Co	do	625.00
	C. Wiser	Carriage for typewriter	5.00
	American Typefounders Co	Leads	.69
	Hoke Engraving Plate Co	Supplies	15.40
	Bell Chalk Plate Co	Recoating plates	9.00
	Chas. E. Johnson Co	Lithographic ink	17.50
	C. S. Braisted	Pencils, etc	123.64
	Chas. E. Johnson Co	Lithographic ink	37.50
	Schneider Bros	Repairs to thermometers	30.00
	Julien P. Freiz	Repairs to anemometers	373.50
	The Chesapeake Electric Co	Copper wire	19.24
	Davis Hunt & Co	Pulley block	2.55
	The J. M. Carpenter Tap and Die Co	Supplies	16.90
	Weston Electrial Instrument Co	do	50.00
	Jas. Hunter	Repairs to building	30.00
	Sprague Electric Co	Electric motor	68.20
	The Kenosha Gas and Electric Co	Electric lights	5.00
	Washburn Electric Light and Power Co	do	4.00
	Georgetown Electric Co	do	2.25
	Marias Lumber Co	do	6.00
	Grand Haven City Electric Light Co	do	3.73
	United Electric Light Power Co	do	24.00
	P. H. Cheney & Son	Electricity	4.66
	H. L. Pittock	Electric current	18.00
	Charleston Consol. Rwy. Gas and Electric Co.	do	3.00
	Vicksburg R. R. Power and Manufacturing Co.	do	9.00
	Ludington Electric Light and Power Co	do	7.50
	The Portland Gas Co	Gas	13.50
	Buffalo Gas Co	do	8.50
	Mill Valley, Mount Tamalpais Scenic Rwy. Co.	Cleaning office	15.00
	Eliz. L. Renoe	Office expenses	3.00
	C. E. Hesse	do	15.50
	R. A. Fessenden	do	2.75
	A. H. Thiessen	do	15.50
	G. H. Willson	do	.75
	Alex G. McAdie	do	2.05
	E. A. Nimmo	do	.50
	D. C. Grunow	do	1.35
	Geo. Reeder	do	1.70
	Eliz. L. Renoe	do	.75
	Pay roll, Harrisburg, Pa	Substation salaries	42.00
	Pay roll, Norfolk, Va	do	105.00

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

WEATHER BUREAU—GENERAL EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
Jan. 16	C. T. Dagwell	Services	$58.76
	Jno. T. Myers	do	15.00
	Kate O'Toole	do	4.50
	E. M. Minehart	Traveling expenses	3.00
	S. W. Glenn	do	6.00
	Jno. D. Blagden	do	30.10
	A. H. Thiessen	do	9.20
	W. M. Fulton	do	15.50
	H. E. Hobbs	do	7.45
	E. H. Emery	do	2.38
	Conrad E. Hesse	do	6.70
17	Zetta Higgins	Services	30.00
	G. F. Lozier	do	12.00
	E. J. Kelliher	do	15.00
	W. T. Tubeville	do	15.00
	Jno. S. Barney	do	49.35
	Mary E. Shelden	Office rent	93.75
	Homer W. Styron	do	38.62
	M. E. Conway	do	37.74
	Tacoma Chamber of Commerce and Board of Trade.	do	60.00
	Pay roll, Pensacola, Fla	Substations, salaries	36.00
	Pay roll, Charleston, S. C	do	67.50
	Pay roll, Tampa, Fla	do	1.00
	Pay roll, Pittsburg, Pa	do	334.00
	Pay roll, Buffalo, N. Y	do	101.82
	Pay roll, Baltimore, Md	do	45.00
	Pay roll, New York, N. Y	do	38.87
	Pay roll, Cleveland, Ohio	do	76.94
	Pay roll, Baltimore, Md	do	45.00
	Michael O'Leary	Sand	1.50
	Mackall Bros	Sodium hyposulphite	2.77
	W. S. Jenks	Oil heaters	14.00
	Geo. F. Muth & Co	White lead	1.19
	Thos. W. Smith	Work on telegraph mast	40.00
	National Electric Supply Co	Lamps, etc	6.20
	R. Carter Ballantyne	Shipping tags	5.48
	Jno. C. Parker	Paper	15.00
	do	Erasers	2,961.44
	Union Typewriter and Supplies Co	Drawband, etc	.90
	Smith Premier Typewriter Co	Platen and brush	2.50
	The Maurice Joyce Engraving Co	Photo-engraving	32.43
	do	do	11.32
	do	Electrotype plates	28.13
	do	Photo engraving plate	1.95
	W. B. Moses & Sons	Furniture	131.48
	do	do	39.95
	J. Baumgarten & Sons	Rubber stamps	.67
	Broderick Bros	Rags	14.00
	S. A. Potter	Use of ground at Arlington	30.00
	Standard Oil Co	Benzine	6.70
	O. J. Maigne	Recasting rollers	17.92
	Jas. B. Lambie	Grindstone	1.50
	Clark & Davenport	Making carpet, etc	74.57
	M. G. Copeland	Flags	543.68
	Ohio River Telephone Line	Telephone service	5.00
	Iowa Telephone Line	Telephone rent	13.50
	Michigan Telephone Line	do	12.00
	do	Telephone services	9.00
	Southern Bell Telephone and Telegraph Co.	Telephone rent	7.50
	R. L. Lewis	Telephone services	18.75
	The Bell Telephone Co. of Missouri	do	16.25
	Rising Sun Telegraph Line	Telegraph service	2.50
	Corvallis & Eastern R. R. Co	do	2.50
	Ocean Tow Boat Line	do	2.25
	The Geo. W. Knox Express Co	Freight	1.13
	O. J. Glenn	Drayage	2.65
	Atlantic Coast Line R. R. Co	Passenger transportation	2.50
	Houston & Texas Central R. R. Co	do	19.85
	New Bedford, Marthas Vineyard & Nantucket S. B. Co.	do	3.60
	Oregon Short Line R. R. Co.	do	16.00
	Pere Marquette R. R. Co	do	5.45
	Southern Rwy. Co	do	17.50
	Adams Express Co	Transportation	80.01
18	E. A. Robertson	Repairs to clock	5.00
	Jas. K. Lemon & Son	do	5.00
	Flint & Walling Manufacturing Co	Flagstaff	22.75
	W. F. Jones	Erecting storm tower	95.00
	B. S. Partridge	do	65.00

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

WEATHER BUREAU—GENERAL EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
Jan. 18	McCormick & Bates	Hauling	$0.50
	Peoples Gas Light and Coke Co	Gas	7.20
	E. F. Sanguinetti	Coal oil matches	8.00
	C. J. Oyler	Washing towels, etc	4.50
	H. C. Hotfitter	Repairing clock	1.50
	O. C. Johnson	Wood and brooms	11.50
	P. Minor	Ice	5.25
	F. L. Ewing	do	8.50
	Consumers' Ice Co	do	3.95
	The Silver State Towel Supply Co	Towel service	2.25
	W. T. Hayden	do	3.00
	C. Ouvrard	Lamps	121.59
	City Light and Power Commission	Electric lights	9.06
	Excelsior Electric Co	do	2.45
	Edison Sault Electric Co	do	24.79
	Thos. W. Pemberton	do	5.10
	Board of Fire and Water Commissioners	do	5.00
	Arizona Publishing Co	Printing monthly reports	63.00
	McEwen & Lanver	Wood	3.90
	Board of Public Works, Sault Ste. Marie	Water	3.50
	C. B. Little	do	11.00
	Wm. E. Roney	Telephone rent	12.00
	Michigan Telephone Co	do	6.00
	The Chesapeake and Potomac Telephone Co.	do	31.25
	Union Telephone Co	do	5.00
	East Tennessee Telephone Co	do	10.50
	Capital Telephone and Telegraph Co	do	4.50
	Sunset Telephone and Telegraph Co	do	6.80
	Cumberland Telephone and Telegraph Co	do	21.00
	The Colorado Telephone Co	do	22.50
	Luke & Smith	Rent of office	75.00
	Albert Marty	do	165.00
	Jas. K. Porter	do	150.00
	Geo. M. Chappel	Traveling expenses	15.25
	J. M. Sherier	do	8.25
	R. M. Hardinge	Office expenses	1.50
	David Cuthbertson	do	3.96
	Pay roll, Boston, Mass	Substation salaries	638.25
	Pay roll, Shreveport, La	do	28.00
	Pay roll, La Crosse, Wis	do	63.00
	Geo. H. Orr	Services	12.42
21	Pay roll, Vicksburg, Miss	Substation salaries	73.27
	Flint and Walling Manufacturing Co	Signal tower, etc	49.55
	A. Salzman	Repairing clock	2.50
	Barnhart Bros. & Spindler	Brass rule	1.80
	American Bicycle Co	Steel balls	.24
	A. Lillyblade	Bookcases	45.00
	Jas. G. Biddle	Electric supplies	80.00
	Nebraska Telephone Co	Telephone service	14.00
	Cumberland Telephone and Telegraph Co	Telephone rent	29.85
	Joseph Gassenhover	Office rent	90.00
	City of Palestine, Tex	do	78.50
	Kate F. Coke	do	60.00
	Chamber of Commerce Building Co	do	93.21
22	J. W. Bauer	Office expenses	1.00
	O. B. Hart	Traveling expenses	9.50
	Chas. E. Linney	do	32.20
	Homer K. Plough	Services	12.42
	Ed. Kendall	do	24.84
	Johnston Barrett	do	8.00
	Lizzie A. Chidester	do	9.00
	M. M. Laidley	do	21.00
	Thos. A. Boon	do	30.00
	Una V. Hendrix	do	21.00
	C. P. Disney	do	21.00
	N. W. Wagner	do	21.00
	Chas. P. Blachly	do	9.00
	Jas. Evans	do	9.00
	Pay roll, Cincinnati, Ohio	Substation salaries	195.50
	Pay roll, Charleston, S. C	do	18.00
	Pay roll, Portland, Oreg	do	55.00
	Pay roll, Raleigh, N. C	do	66.00
	Pay roll, Mobile, Ala	do	75.00
	Pay roll, Augusta, Ga	do	42.00
	Pay roll, Fort Smith, Ark	do	39.00
	Pay roll, Cairo, Ill	do	131.90
	The Marquette County Savings Co	Office rent	81.29
	Estate of Isaac Eberly	do	154.00
	First National Bank of Morehead	do	66.31
	Northwestern Mutual Life Insurance Co	do	100.00

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

WEATHER BUREAU—GENERAL EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
Jan. 22	Northwestern Mutual Life Insurance Co	Office rent	$8.00
	American Linen Supply Co	Towel service	3.00
	Nashville Laundry Co	do	1.80
	Nashville Gas Co	Gas	11.30
	New Orleans Gas Light Co	do	18.84
	Alpena Electric Light Co	Electric light	5.00
	Cumberland Electric Light and Power Co	do	15.00
	Charlevoix Electric Light Plant	do	4.50
	The Electric Co	do	.85
	E. A. Hughes	do	9.00
	Jas. L. Fulton	Drayage	1.50
	Wm. McLaughlin	do	1.75
	Georgetown and Western R. R. Co	Passenger transportation	2.50
	Southern Bell Telephone and Telegraph Co	Rent of telephone	7.50
	The Northwestern Telephone and Telegraph Exchange Co.	do	9.00
	Hudson River Telephone Co	Service	16.50
	Missouri and Kansas Telephone Co	do	30.00
	H. C. Hansen	Brass rule	5.26
	Christina Peterson	Brooms	1.00
	Babbit, Wood & Co	Erecting storm tower	60.00
	Morgan Iron Works	do	75.00
	Wm. G. Manter	do	100.00
	E. A. Brandes	Repairing instrument shelter	1.75
	W. T. Crenshaw	Repairing typewriter	12.00
23	Geo. M. Hubenger	Towel service	3.00
	Smith & Farwell Co	Renovating carpet	5.00
	Raleigh Electric Co	Electric current	4.50
	E. G. Willyoung	Supplies for testing instruments.	82.75
	Statesmen Printing Co	Printing crop reports, etc	71.50
	Omaha Towel Co	Towel service	3.00
	Pacific States Telephone and Telegraph Co	Telephone service	1.55
	Nebraska Telephone Co	Telephone rent	15.00
	East Tennessee Telephone Co	do	9.00
	People's Telephone and Telegraph Co	do	7.50
	Wisconsin Telephone Co	Telephone service	18.00
	Duluth Telephone Co	do	22.50
	Southern Bell Telephone and Telegraph Co	do	12.00
	do	do	17.00
	do	do	10.00
	The Northwestern Telephone and Telegraph Exchange Co.	do	18.00
	Mobile and Ohio R. R. Co	Passenger transportation	9.30
	Pay roll, New Orleans, La	Substation salaries	84.00
	Pay roll, Wilminton, N. C	do	72.00
	Pay roll, Savannah, Ga	do	61.00
	Pay roll, Narragansett Pier, R. I	do	90.00
	Pay roll, Portland, Oreg	do	65.00
	Pay roll, New Orleans, La	do	63.23
	Jas. C. Morrell	Services	3.87
	H. L. Holden	do	23.87
	D. C. Grunow	Traveling expenses	6.25
	C. W. Ling	do	28.25
	Jno. D. Blagden	do	19.20
	H. F. Alciator	do	8.45
24	Fredk. Springmann	Transportation	20.63
	do	do	13.69
	Marcus Sanchez	Services	15.00
	L. Rogers	do	15.00
	B. F. Modisett	do	30.00
	Amarillo Improvement Co	Office rent	30.00
	Society of Savings	do	285.00
	Bank and Insurance Building Co	do	100.00
	Barnhart Bros. & Spindler	Brass rule	2.24
	do	Supplies	2.90
	American Type Founders' Co	Type	6.50
	do	do	3.15
	Southern Bell Telephone and Telegraph Co	Telephone service	2.85
	Southwestern Telegraph and Telephone Co	Telephone rent	9.00
	East Tennessee Telephone Co	Telephone service	9.00
	Meridian Telephone Co	do	6.00
	Missouri and Kansas Telephone Co	do	9.00
	Sunset Telephone and Telegraph Co	do	6.00
	do	Telephone rent	15.00
	Island Telephone and Telegraph Co	do	18.00
	Raleigh Telephone Exchange	do	7.50
	New York and Pennsylvania Telephone and Telegraph Co.	do	6.75
	Cleveland Telephone Co	do	18.00

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

WEATHER BUREAU—GENERAL EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
Jan. 24	Geo. Meier Co	Lithographic varnish	$6.65
	Union Typewriter and Supplies Co	Roller for typewriter	2.00
	Standard Gas and Electric Co	Gas	12.30
	Electric Lighting Co. of Mobile	Rent of meter	.75
	Wagner Electric Manufacturing Co	Electric motor	80.00
	Peninsular Electric Light and Power Co	Rent of meter	6.72
	Mutual Ice Delivery Co	Ice	3.90
	T. B. Satter-White & Co	do	2.55
	The Okonite Co., Limited	Wire	102.00
	Northern Pacific Rwy. Co	Passenger transportation	5.20
	Black & Clark	Shelving	6.50
	Henry Fair	Laying carpet	4.50
25	J. P. Nawrath	Twine	79.44
	Thos. S. Handley	Instrument shelter	3.00
	M. A. Adsitt	Repairs to typewriter	1.20
	Ed. Ketchum	Moving office	285.00
	Max Levy	Services	40.00
	F. J. Hart	do	10.00
	Badger State Printers Roller Co	Recasting rollers	3.00
	C. S. Clinton	Cleaning thermograph	1.00
	American Type Founders Co	Type, etc	8.27
	Broadwater Pepiin Co	Desk rug	5.00
	Saml. J. Yarger	Staple case	.53
	Adams & Halpien	Repairs to furniture	6.85
	N. B. Floyd	Erecting river gauge	12.00
	W. A. Ricard	Repairs to thermograph clock	4.00
	T. W. Ruete	Wood alcohol	1.25
	Bieg & Rood	Ink	.90
	Thos. Butler	Repairing telegraph line	4.00
	Jno. Lang	do	2.50
	Joe Coley	do	5.00
	H. A. Drinkwater	do	3.75
	Chas. W. Snow	Erecting storm tower	43.00
	Ed. B. Moore	Hauling	1.25
	E. L. Page	Delivering mail	3.50
	H. A. Brosshard	do	3.25
	Danl. W. King		3.75
	Kentucky Laundry Co	Delivering mail	1.50
	W. S. Beldin	Office expenses	3.50
	E. C. Thompson	do	1.20
	W. S. Currier	do	2.00
	Geo. E. Grimes	do	1.45
	G. N. Wilson	do	.80
	Wm. Bell	do	3.00
	L. N. Jesunofsky	do	2.00
	A. E. Hackett	do	2.70
	W. S. Palmer	do	2.50
	J. H. Smith	do	13.00
	Oliver S. Fassig	do	1.50
	J. B. Marbury	do	3.25
	Fenton H. Duff	do	2.30
	Frank L. McClintic	do	2.15
	E. B. Richards	do	7.60
	J. P. Bolton	do	12.00
	W. M. Fulton	Traveling expenses	7.41
	do	do	30.01
	C. E. Hesse	do	4.60
	E. H. Emery	do	2.13
	Pay roll, Parkersburg, W. Va	Substation, salaries	136.25
	Pay roll, Little Rock, Ark	do	9.00
	do	do	42.00
	Pay roll, St. Louis, Mo	do	104.55
	Pay roll, Augusta, Ga	do	55.80
	Pay roll, Chattanooga, Tenn	do	156.90
	Pay roll, Atlanta, Ga	do	100.00
	Pay roll, Montgomery, Ala	do	108.25
26	Willis L. Moore	Traveling expenses	19.80
29	Jno. C. Parker	Oil boards	51.26
	Jas. B. Lambie	Candle wick	2.50
	do	Rolled copper, etc	92.13
	Postal Telegraph Cable Co	Telegraph service	269.75
	Southern Rwy. Co	Transportation	9.24
	Franklin & Co	Field glass	54.00
	Wm. P. Herbst	Bottles	3.00
	M. G. Copeland & Co	Flags	143.00
	S. P. Johnson	Caligraph	69.75
	Broderick Bros	Rags	14.00
	Standard Oil Co	Oil	6.88
	J. Edw. Turton	Instrument shelters	2,340.00
	W. B. Moses & Sons	Furniture	84.50

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

WEATHER BUREAU—GENERAL EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
Jan. 29	W. B. Moses & Sons	Furniture	$53.60
	J. C. Entwistle	Engraving	7.50
	Dulin & Martin Co	Kettle	.65
	The Maurice Joyce Engraving Co	Electrotype plates	21.53
31	W. F. R. Phillips et al	Salaries	284.20
	B. F. Larcombe et al	do	2,829.75
Feb. 1	Michigan Telephone Co	Telephone rent	6.00
	Northwestern Telephone Exchange Co	do	18.00
	Sunset Telephone and Telegraph Co	Telephone services	15.00
	Alabama and Georgia Long-Distance Telephone Co.	do	21.20
	G. W. Finch	do	6.00
	Barron County Telephone Co	do	15.00
	Jackson and Rich Square Telephone Co	do	30.80
	W. H. Holmes	do	6.00
	Ohio River Telephone Co	do	5.00
	Rocky Mountain Bell Telephone Co	do	12.30
	Winton Telegraph Co	Telegraph service	7.70
	International Ocean Telegraph Co	do	129.05
	Isle of Wight Telephone and Telegraph Co.	do	5.00
	do	do	4.60
	Ohio River R. R. Co	do	2.70
	The Central District and Printing Telegraph Co.	do	6.00
	Pay roll, San Francisco, Cal	Substation, salaries	.50
	E. M. Bowman	Drayage	1.25
	California Truck Co	Hauling	7.75
	Pennsylvania R. R. Co	Passenger transportation	120.30
	H. L. Gilbert, county treasurer	Office rent	67.00
	Geo. S. Waite	do	119.82
	Bank of Tehama County	do	99.06
	Catherine Wilson	do	140.82
	J. F. Marck	Printing bulletins	13.75
	Union Typewriter and Supplies Co	Repairs to typewriter	5.90
	Henry J. Ledoux	Arbita water	3.30
	H. Brooker & Co	Kerosene oil, etc	4.56
	Pounsford Stationery Co	Supplies	.68
	J. F. Jackson	Painting supports	5.50
	R. H. Vorpahl	Casting roller	2.95
	L. F. Willoughby	Casting rollers	3.40
	W. H. Renear	Use of horse and wagon	10.00
	W. H. H. Smith	do	17.00
	Jas. R. Hobb	Use of team	1.50
	E. E. Hayes	Use of horse and buggy	3.80
	Addressograph Co	Drum, pads, type, etc	3.81
	do	Ink	3.20
	Walsh & Brand	Services	65.00
	Wm. S. Hewitt	Case	48.00
	Wolfe & Co	File	35.00
	C. H. Whaley	Services	2.00
	Fred Albright	Use of horse	4.00
	Frank Golart, jr	Services	2.00
	H. G. Hart	do	4.00
	Los Angeles Lighting Co	Repairs to gas stove	3.75
	Chicago Edison Co	Electric light	6.13
	Minnesota International Electric Co	Electric current	15.00
	Lincoln Traction Co	do	13.50
	Julius Andrae & Sons Co	Labor and material	2.48
	O. C. G. Urban	Electric light	2.00
2	Western Union Telegraph Co	Telegraph service	15.00
	Aurora and Friendship Telephone Line	Telephone service	7.50
	do	do	5.40
	Cumberland Telephone and Telegraph Co.	Telegraph service	38.00
	Chicago, Burlington and Quincy R. R. Co	do	5.60
	Minneapolis, St. Paul and Sault Ste. Marie Rwy Co.	do	19.26
	Jacksonville and St. Johns Bar Telegraph Line.	do	7.25
	East Tennessee Telephone Co	Telephone service	18.00
	Risingsun Telephone Line	do	2.60
	Corvallis and Eastern R. R. Co	Telegraph service	2.50
	Almo Telephone Co	Telephone service	10.00
	Swedish American Telephone Co	Receiver	4.00
	Iowa Telephone Co	Telephone services	7.40
	Cumberland Telephone and Telegraph Co.	do	153.20
	do	do	31.00
	The Bell Telephone Co. of Buffalo	do	2.75
	Kenelin Cheseedine	Removing property	150.00
	Bennett Bros. Co	Repairing table	1.00
	W. W. Best	Repairing telegraph line	.75

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

WEATHER BUREAU—GENERAL EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
Feb. 2	Jno. W. Holmes	Repairing telegraph line	$1.50
	Universal Supply Co	Ink	2.52
	Cornell University	Repairing furniture, etc	42.50
	O. B. Hart	Office expenses	3.50
	Duluth, South Shore and Atlantic Rwy. Co	Passenger transportation	11.00
	Pay roll, Chicago, Ill	Substation, salaries	851.48
	Pay roll, Nashville, Tenn	do	65.90
4	W. H. Brown	Hauling	.75
	A. A. Bolles	do	5.75
	Jas. A. Bryant	do	13.84
	L. Rogers	Use horse and cart	25.16
	Samuels Transfer and Storage Co	Drayage	.75
	Michigan Central R. R. Co	Passenger transportation	13.95
	Baltimore & Ohio R. R. Co	do	22.00
	New York, New Haven and Hartford R. R. Co.	do	8.45
	Chicago, St. Paul, Minneapolis and Omaha Rwy. Co.	do	1.10
	The Wabash R. R. Co	do	14.00
	Chicago and Northwestern Rwy. Co	do	13.30
	International and Great Northern R. R. Co	do	4.35
	Grand Trunk Rwy. System	do	3.58
	The Atchison, Topeka and Santa Fe Rwy. Co	do	10.90
	Otto B. Hart	Office rent	24.00
	Frank D. Miracle	do	105.00
	Paine Bros	do	73.75
	First National Bank	do	126.00
	Great North Western Telegraph Co. of Canada.	Telegraph services	321.27
	International Ocean Telegraph Co	do	134.10
	Isle of Wight Telephone and Telegraph Co	do	4.40
	The Bell Telephone Co. of Buffalo	Telephone services	5.50
	C. E. Broughton & Co	Services	6.50
	Smith-Premier Typewriter Co	Feed rollers	2.50
	Soo Hardware Co	Coal scoop	.75
	Pacific States Telephone and Telegraph Co	Batteries	2.50
	Paul Poynor	Services	12.75
	Portland General Electric Co	Brushes	1.50
	E. D. Harrison	Repairing clock	2.00
	City Light and Power Co	Services and electric supplies	12.51
	R. W. Luttrell	Services	9.75
	Jas. G. Biddle	Galvanometer mirrors	8.19
	F. O. Bailly & Co	Repairs to self-register	1.40
	Hollivan and Parker	Services	2.10
	Jno. F. Magner	Repairs to telegraph line	5.00
	Curphey & Mundy	Rain-gauge supports	5.00
	Mittag & Volger	Carbon paper	90.00
	N. S. Magee & Co	Coal	14.00
	Flint & Walling Manufacturing Co	Express charges, etc	6.00
	J. C. Stamp	Repairing typewriter	5.50
	J. F. Utley	Services	15.00
	Jno. S. Pinney	Supplies	10.85
	American Type Founders Co	Mahogany blocks, etc	7.79
	M. G. Coleman	Cleaning clock	1.50
	Norman A. Tedderly	River gauge	7.00
	Oskamp, Nolling & Co	Repairing clock	1.50
	J. S. Bettis	Repairing river gauge	5.00
	W. W. Whyback	do	25.00
	J. O. Millham	Oiling floors, etc	20.00
	Frederick & Nelson, Inc	Letterpress stand	16.50
	Consolidated Electric Light Co	Electric light	10.00
	E. F. Ruff	Washing towels	1.08
	S. E. Fisher	Services	20.00
	Chas. J. Dunn	do	23.00
	Bendernagel & Co	Recasting rollers	3.00
	Bingham & Runge	do	3.00
	Thayer & Jackson Stationery Co	Binding charts	9.00
	East Florida Printing Co	Printing crop and climate report.	42.00
	H. A. Sparling	do	54.00
	J. M. Sutton	do	37.33
	Robt. A. Williamson	do	48.00
	E. D. Beattie	do	36.00
	New England Telephone and Telegraph Co	Telephone rent	14.25
	Rocky Mountain Bell Telephone Co	Telephone service	9.00
	Columbia Telephone Co	Telephone rent	6.00
	Aurora and Friendship Telephone Line	Telephone service	7.80
	E. M. Uzzell	Casting rollers	3.75
	Hoke Engraving Plate Co	Recoating plates	62.50
	do	do	62.50

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

WEATHER BUREAU—GENERAL EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
Feb. 4	Hoke Engraving Plate Co	Stereotype metal	$29.40
	American Type Founders Co	Logotype zeros, etc	6.64
	Stickley-Brandt Furniture Co	Repairs to furniture	4.25
	L. H. Murdock	Office expenses	4.85
	H. B. Boyer	do	.25
	J. J. Killiher	do	2.21
	U. G. Purssell	do	.90
	T. F. Townsend	do	1.40
	F. P. Chaffee	do	.90
	T. S. Outram	do	3.76
	W. M. Wilson	do	4.25
	C. F. R. Wappenhaus	do	7.65
	S. W. Glenn	do	.75
	L. M. Pindell	do	3.00
	Alfred H. Thiessen	do	19.01
	do	do	13.91
	L. M. Tarr	do	11.30
	N. M. Cunningham	Traveling expenses	4.50
	Jas. H. Scarr	do	14.10
	W. M. Fulton	do	9.40
	Pay roll, Portland, Me	Substation, salaries	75.00
5	Frank Springmann	Transportation	10.22
7	Western Union Telegraph Co	Telegraph services	14,149.02
	do	do	13,660.58
8	L. H. Murdock	Traveling expenses	10.00
	Edw. P. Jones	do	33.70
	Jos. Sands	do	10.75
	A. H. Thiessen	do	7.95
	T. B. Jennings	Office expenses	4.25
	R. H. Dean	do	2.00
	Edw. A. Beals	do	6.20
	Geo. W. Felger	do	.75
	Geo. M. Chappel	do	1.55
	L. G. Schultz	do	3.45
	R. A. Fessenden	do	29.75
	F. H. Clarke	do	4.30
	Wm. M. Dudley	do	1.10
	J. W. Smith	do	4.20
	S. S. Bassler	do	1.50
	Wayland Bailey	do	2.20
	Cumberland Telephone and Telegraph Co.	Telegraph services	37.10
	Dakota Central Telephone Line	do	123.70
	Minneapolis, St. Paul and Sault Ste. Marie Rwy. Co.	do	10.15
	Jacksonville and St. Johns Bar Telegraph Co.	do	9.25
	Ocean Towboat Line	do	4.00
	Philadelphia, Reading and Pottsville Telegraph Co.	do	21.45
	Enterprise Telegraph Co	do	10.40
	H. E. Wadsworth	do	72.82
	The Central District and Printing Telegraph Co.	do	6.20
	North Montana Telephone Co	Telephone services	23.10
	Bell Telephone Co. of Buffalo	do	2.20
	Utah and Pacific R. R. Co	do	3.25
	Washington County R. R. Co	Passenger transportation	8.00
	St. Louis and San Francisco R. R. Co	do	9.10
	Pennsylvania Co	do	17.50
	Oregon Short Line R. R. Co	do	6.00
	Chicago Great Western Rwy. Co	do	12.30
	Duluth, South Shore and Atlantic Rwy. Co	do	13.13
	Ann Arbor R. R. Co	do	3.78
	Fred Albright	Use horse	2.00
	do	do	4.00
	H. G. Hart	Services	8.00
	Seth I. Davis	Labor	3.00
	Geo. Meier & Co	Rubber blankets	40.00
	Keystone Type Foundry	Tweezers	1.73
	Walter Scott & Co	Rubbers, printing office	2.19
	Kansas City and Southern Lumber Co	Instrument shelters	10.00
	Wm. Canfield	Renovating carpets	4.50
	Standard Oil Co	Oil, etc	11.14
	R. C. Francis	Painting	2.50
	Niel Ferguson	Drayage	3.80
	Davis Planing Mills Co	Battery cases	8.00
9	G. N. Salisbury	Office expenses	4.60
	C. P. Cronk	do	3.50
	H. W. Grasse	do	4.50
	R. A. Allen	do	19.00

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

WEATHER BUREAU—GENERAL EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
Feb. 9	T. J. Considine	Office expenses	$10.63
	I. M. Cline	do	5.90
	Marsden Wright	do	3.25
	E. H. Emery	do	19.50
	Pay roll, Jacksonville, Fla	Substations, salaries	80.00
	Pay roll, Galveston, Tex	do	30.00
	W. B. Stockman	Office expenses	43.50
	Ohio River R. R. Co	Telegraph services	4.55
	South Florida Telegraph Co	do	3.20
	Western Union Telegraph Co	do	54.72
	Chicago, Burlington and Quincy R. R. Co	do	2.71
	International Ocean Telegraph Co	do	167.36
	Postal Telegraph Cable Co	do	287.15
	do	do	280.17
	Geo. C. Maynard	do	62.56
	The Kelly Island and Sandusky Cable Co	do	9.50
	Atlanta and Georgia Long Distance Telephone Co.	Telephone services	20.00
	Washington Steamboat Co	Transportation	10.75
	Norfolk and Washington, D. C., Steamboat Co.	Passenger transportation	5.00
	Great Northern Rwy. Co	do	48.85
	Improvement Loan and Trust Co	Office rent	50.00
	Cedar City Furniture Co	do	67.95
	Jos. Bryan	do	150.00
	The Henry Walke Co	Supplies for station	18.33
	Eimer & Amend	do	1.35
	Jno. A. Roebling Sons Co	Cable	245.00
	do	Wire	13.12
	Ira Minnahan	Services	2.00
	W. L. Clark	Repairs to caligraph	2.00
	Edwin Hayte	Services	2.00
	The Smith Premier Typewriter Co	Repairing typewriter	3.00
	Geo. F. Muth & Co	White lead	11.90
	Rudolph West & Co	Screws	1.46
	Mackall Bros	Glycerine	3.35
	National Electrical Supply Co	Rheostat	6.50
	J. E. Turton	Oak pedestal	43.00
	R. Carter Ballantyne	Rubber bands	7.29
	The J. C. Ergood Co	Soap, etc	64.30
	The Maurice Joyce Engraving Co	Supplies for printing office	5.67
	do	do	10.91
	C. W. Davis & Bro	Type cabinet	9.00
	J. J. Rackley	Renovating furniture	25.00
	H. P. Moss	Letter-press stand	29.00
	Spaler & Glenn	Printing summary	62.50
	Jno. C. Parker	Brace for stand	1.00
	O'Neal & Son	Cleaning carpets, etc	4.50
	Jno. H. Hecker	Erecting storm tower	75.00
	Galveston Gas Co	Gas	14.10
	Max Levy	Electric current	30.00
	Southwestern Telegraph and Telephone Co.	Telphone service	12.00
	Southern Bell Telephone and Telegraph Co.	do	7.50
	A. B. Wood	Washing towels	3.00
11	Frank Springmann	Transportation	23.08
13	Merchants and Miners' Transportation Co.	do	.38
	Duluth and Iron Range R. R. Co	do	.97
	International and Great Northern Rwy. Co.	do	.78
	Lake Shore and Michigan Southern Rwy. Co.	do	9.27
	Nashville, Chattanooga and St. Louis Rwy. Co.	do	.83
	Pere Marquette R. R. Co	do	1.07
	do	do	5.52
	San Antonio and Aransas Pass Rwy. Co	do	1.55
	Chas. F. James	do	1.00
	The Santa Fe, Prescott and Phoenix Rwy. Co.	do	5.50
	Southern Pacific Co	do	1.53
	Texas and Pacific Rwy. Co	do	1.60
	Louisville and Nashville R. R. Co	do	15.24
	do	do	1.34
	Wabash R. R. Co	do	1.82
	Cleveland, Cincinnati, Chicago and St. Louis Rwy. Co.	do	2.65
	Harry E. Overstreet	do	.99
	Anchor Line	do	2.76

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

WEATHER BUREAU—GENERAL EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
Feb. 13	Anchor Line	Transportation	$2.00
	Steamer G. W. Danielson	do	1.74
	Alabama, Mississippi and Tennessee Telephone Co.	Telephone service	6.50
	do	do	6.25
	do	do	6.75
	New England Telephone and Telegraph Co	do	9.10
	Staunton Mutual Telephone Co	do	37.50
	Northern Telegraph Co	Telegraph service	15.30
	Ohio River R. R. Co	do	2.50
	Postal Telegraph-Cable Co., of Texas	do	18.16
	do	do	23.71
	Pay roll, Galveston, Tex	Substation, salaries	45.41
	Pay roll, New York, N. Y	do	35.00
	The Atchison, Topeka and Santa Fe Rwy. Co.	Passenger transportation	29.45
	Grand Rapids and Indiana Rwy. Co	do	3.75
	Rawlins and Northwestern Stage Co	do	30.00
	A. B. Payne	Services	3.00
	T. B. Halloran	do	2.00
	Henry E. Craven	do	2.50
	C. H. Moffett	do	2.00
	D. D. Booze	do	1.50
	C. E. Hesse	Traveling expenses	30.00
	A. H. Thiessen	do	31.00
	C. E. Hasse	Office expenses	18.00
	Henry B. Hersey	Traveling expenses	11.50
	Jos. P. Fallihee	Office expenses	4.00
	N. B. Conger	Traveling expenses	99.50
	Wayland Bailey	do	5.65
	C. L. Park	do	5.50
	W. H. Fallon	Office expenses	1.10
	D. B. Miller	Services	15.00
	Merritt Cary	Printing summary	45.00
	Norfolk Steam Laundry Co	Washing towels	3.00
	Geo. L. Ferrin	Repairs to flagstaff	3.00
	K. Cheseldine	Hoops	19.00
	Ryan & Co	Framing charts	8.75
	United States Envelope Co,	Envelopes	173.75
	J. H. Thiemeyer	Pine boxes	69.00
	Morse Twist Drill and Machine Co	Twist drills	1.66
	Jno. A. Roebling's Son's Co	Wire	10.62
	J. M. Small	Cartage, etc	3.50
	Patterson Transfer Co	Hauling	1.00
	Chase Paint and Oil Co	Oil	2.50
	J. S. Pinney	Brass rule	3.00
18	Geo. F. Muth & Co	Oil, etc	42.48
	W. B. Moses & Co	Table	13.45
	do	Recovering chairs	1.85
	J. Edw. Turton	Map frames	290.00
	Woodward & Lothrop	Text-books	1,257.80
	Maurice Joyce Engraving Co	Photo-engraving plate	.98
	Woodruff Manufacturing Co	File case	41.00
	Jno. C. Parker	Paper	880.00
	Rudolph West & Co	Brass figures	31.50
	J. C. Entwistle	Engraving	7.50
	R. Carter Ballantyne	Supplies	99.15
	Michael O'Leary	Sand	1.50
	Postal Telegraph Cable Co	Telegraph service	28.65
	United States Express Co	Transportation	60.06
	do	do	21.90
19	The Great North Western Telegraph Co	Telegraph service	163.53
	Minneapolis, St. Paul and Sault Ste. Marie Rwy. Co.	do	10.18
	The Hocking Valley Rwy. Co	Passenger transportation	3.30
	J. S. Hazen	Office expenses	2.45
	E. B. Richards	do	8.05
	do	Traveling expenses	4.50
	Jos. F. Marek	Printing bulletin	11.00
	Statesman Printing Co	Printing summary	44.00
	Jno. W. Holmes	Services	1.50
	Julien P. Friez	Sockets	93.75
	do	Pens	107.50
	Jones Carpet Store	Carpets, etc	124.13
	Weston Electrical Instrument Co	Weston relay	25.00
	Barnhardt Bros. & Spindler	Type	2.71
	D. P. Hopkins	Repairs to furniture	18.76
	Addressograph Co	Stamper head, etc	1.00
	W. F. & Jno. Barnes Co	Saws	8.40
	G. C. Krause	Repairs to typewriter	5.50

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

WEATHER BUREAU—GENERAL EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
Feb. 19	M. L. Cohen	Repairs to clock	$2.00
	P. Hensen	Services and material	12.00
	Chas. E. Johnson & Co	Duplicating ink	800.00
	M. Sweder & Co	Erection of tower	135.00
	E. J. Shattuck & Co	Oil	.50
	Phillips Bros	Binding charts	8.00
	Norton Furniture Co	Repairs, etc., furniture	23.20
	Donahue & Shoebottom Electric Co	Services	45.00
20	Texas and Pacific Rwy Co	Transportation	1.52
	do	do	1.52
	Southern Pacific Co	do	1.42
	Michigan Central R. R. Co	do	3.25
	Lehigh Valley R. R. Co	do	3.46
	Lake Shore and Michigan Southern Rwy. Co.	do	17.32
	Wisconsin Central Rwy. Co	do	1.15
	Wabash R. R. Co	do	.87
	St. Louis, Keokuk and Northwestern R. R. Co.	do	2.20
	Nashville, Chattanooga and St. Louis Rwy. Co.	do	5.95
	Grand Rapids and Indiana Rwy. Co	do	2.25
	Detroit and Cleveland Navigation Co	do	3.09
	Burlington and Missouri River R. R. in Nebraska.	do	4.54
	The Rio Grande Southern R. R. Co	do	2.20
	The Denver and Rio Grande R. R. Co	do	.67
	New Bedford, Marthas Vineyard and Nantucket Steamboat Co.	do	4.71
	Baltimore and Ohio Southwestern R. R. Co	do	2.18
	do	do	.40
	do	do	4.95
	New York, New Haven and Hartford R. R. Co.	do	.44
	Rome, Watertown and Ogdensburg R. R. Co.	do	.92
	Boston and Albany R. R. Co	do	16.80
	Jno. C. Davis	do	1.98
	Lower Coast Packet	do	8.50
	do	do	.50
	Star Union Line	do	1.38
	do	do	2.48
	do	do	.45
	Missouri Pacific Rwy. Co	do	3.80
	do	do	.63
23	Herbrick & Laurence	Repairing electric lights	11.00
	H. J. Green	Barometer boxes	36.00
	Maxwell & Taylor	Washstand	3.00
	Union Typewriter and Supplies Co	Stencil paper	2.00
	Jas. Fitzsimmons & Co	Renovating furniture	47.97
	Wm. F. Coston	Signals	33.00
	Chas. A. Stickney & Co	Gasoline engine	200.00
	Lowman & Hanford Stationery and Printing Co.	Ink and mucilage	6.00
	Watts Bros	Services	18.50
	O. P. Card	Laying linoleum	2.50
	E. W. Turner	Cleaning clock	1.50
	Union Photographic Engraving Co	Pictures	12.80
	E. C. Fuller & Co	Wire and nippers	5.15
	J. A. Barnes	Coal	84.38
	Hoke Engraving Plate Co	Recoating plates	48.75
	do	do	62.50
	do	do	75.00
	F. G. Blaisdell	Water	18.00
	The Globe Wernicke Co	Cabinet	41.25
	Carter Ink Co	Ink	25.80
	Houghton & Delano	Lantern-slide plates	.85
	A. N. Bucklin	Copper fans	2.50
	Daniel Daly	Casting rollers	3.15
	M. L. Johnson	Moving furniture	25.00
	M. Wiegand & Co	Lumber	188.00
	J. Baumgarten & Sons	Rubber stamp	13.39
	Jas. B. Lambie	Supplies for instrument repairing.	9.20
	do	Screw-driver	1.50
	New Orleans and North Eastern R. R. Co	Passenger transportation	52.60
	Utah and Pacific R. R. Co	do	3.25
	Lake Shore and Michigan Southern Rwy. Co.	do	7.55
	Northern Pacific Rwy. Co	do	1.70

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

WEATHER BUREAU—GENERAL EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
Feb. 23	Southern Rwy. Co	Passenger transportation	$3.33
	do	do	3.33
	Michigan Telephone Co	Telephone service	16.40
	South Florida Telegraph Co	Telegraph service	3.30
	Postal Telegraph Cable Co. of Texas	do	28.58
	Jacksonville and St. Johns Bar Telegraph Co.	do	7.75
	Philadelphia, Reading and Pottsville Telegraph Co.	do	11.45
	Ocean Towboat Line	do	1.00
	Postal Telegraph Cable Co	do	32.82
	Marsden Wright	Traveling expenses	3.75
	P. H. Smyth	do	3.00
	N. B. Conger	do	16.75
	R. A. Fessenden	do	14.75
	J. W. Smith	do	13.61
	Thos. J. Considine	do	9.00
	E. T. Giers	do	10.35
	G. E. Franklin	Office expenses	3.15
	A. J. Mitchell	do	5.00
	Chas. W. Ling	do	1.00
	Lee A. Denson	do	2.20
	O. C. Burrows	do	2.25
	S. Hackett	do	1.50
	W. T. Blythe	do	1.72
	do	do	69.20
25	Pere Marquette R. R. Co	Transportation	1.52
	do	do	2.54
	Steamer Geo. W. Danielson	do	8.50
	do	do	2.41
	Fremont, Elkhorn and Missouri Valley R. R. Co.	do	.33
	do	do	1.13
	Baltimore and Ohio R. R. Co	do	10.01
	do	do	3.04
	Pennsylvania R. R. Co	do	.85
	Louisville and Nashville R. R. Co	do	2.50
	do	do	46.06
	Union Pacific R. R. Co	do	2.30
	Virginia and Truckee R. R. Co	do	.63
	do	do	1.25
	do	do	1.01
	Chicago and Northwestern Rwy. Co	do	16.42
28	B. F. Larcombe et al	Salaries	2,655.00
	W. F. R. Phillips et al	do	256.60
Mar. 5	Wm. Crawford	Hire horse	.50
	C. E. Johnson	Services	4.00
	do	do	8.00
	The Storage Battery Supply Co	Hydrometer syringe	5.00
	Phillip Lindemeyr	Mucilage, etc	256.00
	F. J. Carter	Repairing typewriter	4.00
	The Merchants Publishing Co	Printing annual summary	50.00
	Julien P. Friez	Barographs, etc	743.50
	United States Envelope Co	Envelopes	.91
	Walter Scott & Co	Screws	5.00
	Chas. E. Johnson & Co	Ink	52.50
	R. N. Getty	Wire	26.50
	American Type Founders Co	Staples, type, etc	39.18
	Chester Brierley	Services	3.00
	Alabama, Mississippi and Tennessee Telephone Co.	Telephone service	6.50
	Ohio River Telephone Line	do	5.20
	Michigan Telephone Co	do	2.00
	Rising Sun Telegraph Line	Telegraph services	2.60
	Great Northwestern Telegraph Co. of Canada.	do	154.81
	Isle of Wight Telephone and Telegraph Co.	do	5.20
	Corvallis and Eastern R. R. Co	do	2.60
	L. M. Dey, jr	Office expenses	7.96
	A. H. Thiessen	do	28.35
	Wm. Bell	do	1.50
	Jno. R. Morton	do	1.25
	Corydon P. Cronk	do	2.40
	Wayland Bailey	do	14.03
	do	do	22.08
	do	Traveling expenses	8.35
	R. A. Fessenden	do	22.70
	do	do	52.31
6	Postal Telegraph Cable Co	Telegraph service	34.42
	R. L. Lamb	Inking pads	11.25

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

WEATHER BUREAU—GENERAL EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
Mar. 6	Fred. A. Schmidt	Measuring sticks	$92.00
	A. A. Wagner	Rain gauges	290.00
	W. B. Moses & Sons	Mats	24.00
	Rudolph, West & Co	Paint, brushes, etc	290.62
	R. P. Clarke & Co	Millinet	2.06
	J. E. Turton	Card holders	843.47
	do	Supports	114.00
7	Indiana Printing and Manufacturing Co	Printing annual summary	60.00
	G. H. Baughman	Binding maps	1.75
	Twentieth Century Press	Printing summary	60.00
	Lewis Westbrook	Services	3.00
	Fred. Albright	Horse hire	4.00
	H. H. Hodgson	Repairs to typewriter	1.70
	F. W. Sambrook	Lumber	4.63
	Gether & Drebert Co	Services	10.50
	A. J. Campbell	Reefing halyards	6.00
	W. J. May	Shelving	19.50
	Small & Co	Repairing flags	1.75
	Badger State Printers Roller Co	Recasting rollers	3.00
	Edwin R. Smith	Erecting flagstaff	29.00
	Harrington & Tobin	Lamp chimneys	1.10
	Yanice Parker	Painting instrument shelters	5.25
	W. G. Johnston & Co	Silk backing	5.10
	Peter Gray	Lanterns	20.00
	Ed. Kinsgbury	Repairing furniture	4.25
	H. G. Dyson	Clamps	1.50
	The J. K. Gill Co	Ink	3.50
	H. Pembrooke	do	3.50
	California Ink Co	Casting rollers	2.55
	Alabama and Georgia Long Distance Telephone Co.	Telephone service	20.80
	Peter C. Battaile	Services	10.73
	T. S. Collins	Office expenses	1.00
	Jno. R. Weeks	do	.50
	Ed. A. Evans	do	3.75
	T. F. Townsend	Traveling expenses	4.00
	Geo. M. Chappell	do	8.48
	N. B. Conger	do	4.85
	Michigan Central R. R. Co	Passenger transportation	24.33
	Chicago and Alton R. R. Co	do	8.55
	Chicago and Northwestern Rwy. Co	do	7.80
	Santa Fe Pacific R. R. Co	do	46.15
	Fred Springmann	Transportation	17.84
12	W. B. Moses & Sons	Instrument stands	378.00
	Jas. B. Lambie	Tool steel	1.50
	do	Wire brads	1.20
	do	Turn-buckles	2.20
	Broderick Bros	Rags	14.00
	Jno. C. Parker	Cardboard	440.00
	Martha Carter	Services	10.65
	D. Frank Parker	Paper, varnish, typewriter ribbon, etc.	1,629.65
	United States Express Co	Transportation	13.08
	Norfolk and Washington Steamboat Co	do	3.22
14	J. J. Kelliher	Office expenses	3.00
	J. H. Means	Drayage	10.00
	Luke Markishtun	Services	4.00
	H. McP. Baldwin	Traveling expenses	12.75
	R. M. Gedding	do	11.25
	State Journal Co	Casting rollers, etc	8.75
	F. J. Walz	Traveling expenses	6.50
	do	Office expenses	19.12
19	W. M. Fulton	do	36.25
	J. P. Fallihee	do	6.50
	Chas. Adie	do	1.85
	C. P. Cronk	do	5.59
	E. B. Richards	do	5.25
	N. R. Taylor	Traveling expenses	16.50
	Jas. F. Atherton	do	6.00
	E. A. Beals	do	17.85
	N. B. Conger	do	28.00
	Pay roll, New York, N. Y	Substation salaries	35.00
	Aurora and Friendship Telephone Line	Telephone service	7.80
	Put-in-Bay Telegraph Co	Telegraph service	13.14
	International Ocean Telegraph Co	do	218.62
	Postal Telegraph-Cable Co. of Texas	do	29.61
	People's Telephone Co	Telephone service	3.00
	Ohio River R. R. Co	Telegraph service	2.70
	Chicago, Burlington and Quincy R. R. Co	do	3.01
	New England Telephone and Telegraph Co	do	12.84

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

WEATHER BUREAU—GENERAL EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
Mar. 19	Hoke Engraving Plate Co	Recoating plates	$25.00
	do	Stereotype metal	33.15
	do	do	62.50
	do	Recoating plates	52.50
	do	Handles, etc	6.00
	Lake Shore and Michigan Southern Rwy. Co.	Passenger transportation	2.60
	The Oregon R. R. and Navigation Co	do	41.75
	Oregon Short Line	do	22.90
	Rio Grande Western Rwy. Co	do	13.00
	Utah and Pacific R. R. Co	do	3.25
	Union Pacific R. R. Co	do	28.35
	Jas. Hunter	Cartage	2.50
	Barnhart Bros. & Spindler	Chase	1.71
	Western Electrical Instrument Co	Relays	12.68
	E. C. Fuller & Co	Wire stitching machine	1.50
	Carter, Rice & Co. (corporation)	Book paper	264.00
	J. H. Thiemeyer	Packing boxes	5.20
	Frederick & Nelson	Table	9.00
	K. Cheseldine	Labor and material	850.00
	G. B. Carwing	Services	10.00
	D. P. Fisher	Repairs to instrument stand	1.00
	Wm. Lamb	Repairs to rowboat	12.00
	J. R. Speer	Labor and material	10.00
	The Globe-Wernicke Co	Cards	3.60
	Barnhart Bros. & Spindler	Chases	3.42
	P. H. Seewald	Repairing clock	4.00
	Rand, McNally & Co	Charts	180.00
	Western Union Telegraph Co	Repairs to telegraph line	5.33
	W. W. Best	do	2.00
	Jas. R. Hobbs	do	3.00
	Arizona Publishing Co	Printing bulletins	50.00
	E. D. Beattie	do	5.00
	C. H. Crocker & Co	do	107.00
	Cumberland Presbyterian Publishing House.	do	44.00
	The Daggett Printing Co	do	3.00
	Jas. F. Marek	do	11.00
	O. J. Maigne	Recasting rollers	19.88
	W. H. Ranney	do	3.75
	L. H. Jones	do	2.70
20	Frank L. McClintic	Office expenses	1.80
	Wm. Bell	do	90.00
	Geo. A. Loveland	do	11.21
	J. H. Smith	do	4.95
	Chas. M. Strong	do	3.40
	Jno. R. Weeks	Traveling expenses	12.62
	H. P. Hersey	do	49.57
	Ohio River Telephone Line	Telephone services	4.60
	Alabama, Mississippi, and Tennessee Telephone Co.	do	6.00
	J. T. Harper	Telegraph services	15.03
	Rising Sun Telegraph Line	do	2.30
	Minneapolis, St. Paul and Sault Ste. Marie Rwy. Co.	do	10.68
	Corvallis and Eastern R. R. Co	do	2.30
	Henry J. Green	Thermometers, etc	1,200.00
	American Type Founders Co	Logotype	2.60
	Keystone Type Foundry	Supplies	.63
	H. B. McVeigh	Services	8.75
	P. C. Atwood	Benzine	1.00
	E. A. Sawyer	Services	15.00
	Julien P. Freiz	Supplies	1,633.00
	F. H. Lovell & Co	Clocks	64.50
	Geo. Meier & Co	Pencils	.50
	Jno. W. Holmes	Repairing telegraph line	4.50
21	Western Union Telegraph Co	Telegraph services	14,265.52
	do	do	13,798.11
22	M. Du Perow	Gordon battery	816.00
	Richd. A. Shaw	Cleaning map	10.65
	Thos. Somerville & Sons	Fitting for garden hose	1.31
	Jas. B. Lambie	Supplies	7.60
	Postal Telegraph-Cable Co	Telegraph service	263.64
	Norfolk and Washington Steamboat Co	Passenger transportation	3.00
	Adams Express Co	Transportation	19.10
	Illinois Central R. R. Co	do	.61
	do	do	.27
	Chicago, Rock Island and Texas Rwy. Co	do	1.44
	Chicago, Milwaukee and St. Paul Rwy. Co	do	.92
	do	do	1.79

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

WEATHER BUREAU—GENERAL EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
Mar. 22	Chicago and Northwestern Rwy. Co	Transportation	$17.82
	Pennsylvania R. R. Co	do	.80
	do	do	.69
	Baltimore and Ohio Southwestern R. R. Co.	do	3.88
	do	do	.40
	Baltimore and Ohio R. R. Co	do	8.83
	do	do	.36
	Detroit and Mackinac Rwy. Co	do	7.06
	do	do	4.27
	Boston and Maine R. R. Co	do	.70
	do	do	1.11
	Burlington and Missouri River R. R. in Nebraska.	do	35.99
	do	do	13.20
	New Bedford, Marthas Vineyard and Nantucket Steamboat Co.	do	15.22
	Fremont, Elkhorn and Missouri Valley R. R. Co.	do	.31
	Ann Arbor R. R. Co	do	2.05
	New Bedford, Marthas Vineyard and Nantucket Steamboat Co.	do	3.77
	Pere Marquette R. R. Co	do	3.41
	Delaware, Lackawanna and Western R. R. Co	do	1.37
	Delaware and Hudson Co	do	1.85
	Boston and Albany R. R. Co	do	.94
	Maine Central R. R. Co	do	.75
	Richmond, Fredericksburg and Potomac R. R. Co.	do	.79
	St. Louis, Keokuk and Northwestern R. R. Co.	do	.54
	Star Union Line	do	1.08
	Wabash R. R. Co	do	2.27
	Washington County R. R. Co	do	.94
	The Oregon Short Line R. R. Co	do	1.52
	Texas-Mexican Rwy. Co	do	9.45
	The Santa Fe, Prescott and Phoenix Rwy. Co.	do	11.15
	Northern Central Rwy. Co	do	.45
	Michigan Central R. R. Co	do	1.87
	Louisville, Evansville and St. Louis Consolidated R. R. Co.	do	.95
	Lake Shore and Michigan Southern Rwy. Co.	do	8.03
	Lake Michigan and Lake Superior Transportation Co.	do	7.92
	The Erie and Western Transportation Co.	do	3.38
	The Colorado and Southern Rwy. Co	do	1.44
	Cleveland, Cincinnati, Chicago and St. Louis Rwy. Co.	do	1.23
	Harry E. Overstreet	do	.53
23	Morgan R. Sanford	Traveling expenses	2.20
	E. A. Beals	do	32.75
	Kenelin Cheseldine	Erecting poles	10.00
	R. N. Morrison Construction Co	Repairing wind vane	26.50
	Jas. Hunter	Repairing roof, etc	5.00
	C. D. Peacock	Repairing clock	4.00
	Jas. R. Biddle	Rubber jars	9.15
	Queen & Co., Incorporated	Altering induction coil, etc	26.77
	Valley Paper Co	Paper	811.80
	J. S. Stahl & Co	Repairing typewriter	4.00
	P. H. Seawald	Repairing clock	2.00
	Addressograph Co	Type, etc	4.84
	Jno. Phillips & Co., Limited	Repairs to register case	.82
	Louis Lindenberg	Brass wire, etc	2.46
	D. B. Walker	Storm tower	43.00
	Johnson & Venners	Erection of tower	22.50
	A. Gilchrist	Repairing clock	4.50
	Pennsylvania R. R. Co	Passenger transportation	1.75
	The Texas Pacific Rwy Co	do	29.60
	Rawlins and Northwestern Stage Line	do	1.55
	American Type Founders Co	Type, etc	23.41
26	Baumgarten & Sons	Logotypes, etc	434.74
	The Maurice Joyce Engraving Co	Photo-engravings, etc	11.53
	do	Map symbols	31.00
	do	Electrotype plates	3.63
	Jno. C. Parker	Cardboard	176.00
	Wyckoff, Seamans & Benedict	Repairing typewriter	12.50
	Mackall Bros	Alcohol, etc	5.80
	J. C. Entwistle	Engraving	7.50
28	Missouri Pacific Rwy. Co	Transportation	12.01

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

WEATHER BUREAU—GENERAL EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
Mar. 28	Missouri Pacific Rwy Co	Transportation	$4.22
	Southern Pacific Co	do	.69
	Chicago, Peoria and St. Louis Rwy. Co	do	.75
	Chicago, Milwaukee and St. Paul Rwy. Co.	do	1.04
	do	do	.92
	Chicago, Burlington and Quincy R. R. Co.	do	1.07
	do	do	2.81
	do	do	.84
	do	do	4.59
	Cleveland, Cincinnati, Chicago and St. Louis Rwy. Co.	do	3.55
	do	do	2.84
	Chicago and Northwestern Rwy. Co	do	18.96
	Rome, Watertown and Ogdensburg R. R.	do	3.58
	New York Central and Hudson River R. R. Co.	do	1.76
	do	do	2.45
	do	do	9.81
	Pennsylvania R. R. Co	do	1.03
	do	do	.47
	do	do	.46
	do	do	1.11
	do	do	.57
	do	do	.46
	do	do	1.24
	Boston and Maine R. R. Co	do	7.28
	do	do	.44
	The Riverside Storage and Cartage Co	do	.81
	do	do	1.06
	Atchison, Topeka and Santa Fe Rwy. Co	do	10.93
	do	do	7.69
	Chesapeake and Ohio R. R. Co	do	.84
	do	do	4.74
	Star Union Line	do	.99
	do	do	5.92
	St. Louis Southwestern Rwy. Co	do	.82
	Texas Pacific Rwy. Co	do	6.99
	Atlantic Coast Line R. R. Co	do	1.92
	Rutland Rwy. Co	do	.95
	Carolina and Northwestern Rwy. Co	do	.42
	Central R. R. Co. of New Jersey	do	.37
	Thompson Steamboat Co	do	32.48
	Harry E. Overstreet	do	.12
	Geo. McQuillan	do	.12
	Jos. Urlacher	do	1.50
	Steamer Olympic	do	.70
	St. Louis, Keokuk and Northwestern R. R. Co.	do	1.79
	Fremont, Elkhorn and Missouri Valley R. R. Co.	do	1.01
	Grand Rapids and Indiana Rwy. Co	do	1.34
	Lake Shore and Michigan Southern Rwy. Co.	do	.56
	Lehigh Valley R. R. Co	do	3.78
	Nashville, Chattanooga and St. Louis Rwy. Co.	do	2.32
	do	do	.78
	New Bedford, Marthas Vineyard and Nantucket Steamboat Co.	do	.59
	New York, Chicago and St. Louis R. R. Co	do	4.32
	Sedalia, Warsaw and Southwestern Rwy. Co.	do	.42
	Virginia and Truckee R. R. Co	do	.25
	Savannah, Florida and Western Rwy. Co	do	8.59
	San Antonio and Aransas Pass Rwy	do	2.54
	Detroit and Cleveland Navigation Co	do	1.54
	Norfolk and Southern R. R. Co	do	1.53
	Erie and Western Transportation Co	do	1.64
	The Denver and Rio Grande R. R. Co	do	13.21
30	B. F. Larcombe et al	Salaries	2,850.71
	W. F. R. Phillips et al	do	284.20
	Total, third quarter		135,665.88
Apr. 2	Chicago Auditorium Association	Office rent	450.00
	Balfe D. Johnson	do	63.00
	Wm. Pollman	do	87.50
	Benj. M. Jacobs	do	30.00
	Geo. L. Lovette	do	105.00

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

WEATHER BUREAU—GENERAL EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
Apr. 2	City of Columbia, S. C.	Office rent	$45.00
	Maggie French	do	59.20
	Ulysses G. Myers	do	175.00
	Mary C. Pratt et al	do	93.75
	The Farmers' National Bank of Fresno	do	115.00
	R. McLaughlin	do	150.00
	Conrad National Bank	do	67.50
	Dent & Butler	do	105.00
	Tyree & Wilkins, agents	do	67.50
	Albert W. Kennie	do	42.00
	Walla Walla Lodge, No. 56, I. O. O. F	do	84.87
	Aldana C. Rackcliffe	do	75.00
	E. H. Jamieson	do	135.00
	A. J. Knight	do	82.19
	E. P. Jones	do	25.00
	E. J. Davenport	do	100.00
	O. J. Mairs	do	67.50
	Geo. E. Shaw	do	70.00
	Peter Sonna	do	120.00
	F. E. Warren	do	129.40
	C. M. Beeson	do	88.91
	Eliz L. Renoe	do	100.00
	Utah and Pacific R. R. Co	do	45.00
	Citizens' Bank of Norfolk, Va	do	131.25
	Jno. E. Dooly	do	150.00
	D. Horton	do	120.00
	T. B. Catron	do	105.00
	Bunce & Iiams	do	90.00
	Otto B. Hart	do	24.00
	Robt. W. Munroe	Anemometer, etc	172.88
	H. Wallenberg, administrator	Office rent	77.25
	Simon W. Everitt	do	8.00
	Pacific States Telephone and Telegraph Co.	Telegraph services	4.10
	Isle of Wight Telephone and Telegraph Co.	do	4.40
	Western Union Telegraph Co	do	148.49
	do	do	19.80
	Philadelphia, Reading and Pottsville Telegraph Co.	do	9.58
	The Central District and Printing Telegraph Co.	do	6.60
	J. H. Richmond	Repairs to river gauge	16.50
	S. A. D. Keister	Repairs to clock	2.00
	Barnhart Bros. & Spindler	Supplies	10.92
	D. C. Jones	Services	20.00
	Pere Marquette R. R. Co	Passenger transportation	23.52
	International and Great Northern R. R. Co.	do	5.95
	E. H. Emery	Traveling expenses	5.98
	W. S. Palmer	Office expenses	2.00
	Addressograph Co	Addressographs	270.75
	H. K. Holcombe	Office expenses	1.85
4	The Northwestern Telegraph Exchange Co.	Telephone rent	9.00
	The Inland Telephone and Telegraph Co	do	9.00
	The Bell Telephone Co. of Philadelphia	do	30.00
	Southern Bell Telephone and Telegraph Co.	do	10.00
	do	Services	3.00
	Missouri and Kansas Telephone Co	do	9.00
	do	do	18.00
	Pennsylvania Telephone Co	Telephone rent	20.00
	The Southern New England Telephone Co.	do	27.00
	Rocky Mountain Bell Telephone Co	Telephone rent and services	8.25
	do	Telephone rent	10.50
	Georgia Telephone and Telegraph Co	do	10.00
	do	do	4.19
	Santa Fe Electric Telephone Co	do	6.00
	Capital Telephone and Telegraph Co	do	4.50
	The Empire State Telephone and Telegraph Co.	Services	15.00
	Ontario Telephone Co	do	7.50
	Dodge City Telephone Co	Telephone rent	3.00
	Central Union Telephone Co	Telephone rent and services	40.50
	Southwestern Telegraph and Telephone Co.	Telephone rent	15.00
	do	do	15.00
	do	do	9.00
	Sunset Telephone and Telegraph Co	do	6.00
	La Crosse Telephone Co	do	7.50
	Wisconsin Telephone Co	do	3.75
	Lynchburg Telephone Co	Services	3.00

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

WEATHER BUREAU—GENERAL EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
Apr. 4	Citizens' Telephone Co	Telephone rent	$6.00
	The Telephone Co. of South Jersey	do	5.00
	People's Telephone Co	Services	4.40
	Aurora and Friendship Telephone Line	do	6.90
	Iowa Telephone Co	do	36.00
	Chas. A. Blumner	do	15.00
	R. M. Hardinge	Office expenses	8.20
	Milton L. Leffler	Traveling expenses	19.25
	Wm. Bell	do	1.25
	Alex. G. McAdie	do	22.50
	Frank R. Beahan	do	38.60
	E. B. Richards	do	2.85
	do	do	2.85
6	D. Frank Parker	Typewriter ribbons	2.25
	C. Becker	Calendar for carriage	.50
	Standard Oil Co	Oil	7.15
	M. G. Copeland & Co	Flags	214.50
	Southern Rwy. Co	Passenger transportation	24.80
	do	do	2.64
	Fred. A. Schmidt	Painting chart of river	40.00
	Mackall Bros	Soap, etc	105.58
	The Morris Joyce Engraving Co	Electrotype plates	8.62
	Postal Telegraph-Cable Co	Services	28.64
	do	do	287.54
	A. A. Wagner	Rain gauges	145.00
	Clark & Davenport	Altering carpet	9.49
	do	do	5.66
	National Electrical Supply Co	Electric lamp	.76
10	Great Northwestern Telegraph Co. of Canada.	Telegraph service	116.79
	Southern Florida Telegraph Co	do	8.30
	Jacksonville and St. Johns Bar Telegraph Line.	do	5.50
	Ocean Towboat Line	do	6.00
	The Gamble Desmond Co	Rent of office	100.00
	Indianapolis Gas Co	do	250.00
	Sam B. Hicks et al	do	120.00
	Columbia Building Co	do	87.50
	Hoke Engraving Plate Co	Recoating plates	75.00
	do	do	37.50
	do	Supplies	1.45
	S. A. Potter	Use of ground for flagstaff	30.00
	Fred Albright	Use of horse	2.00
	E. D. Beattie	Printing climate report	36.00
	Reading Paper Mills	Paper	540.00
	C. J. Oyler	Washing towels	4.50
	W. W. Whelan	Repairs to typewriter	.35
	Addressograph Co	Ink pads	1.20
	Inland Type Foundry	Type, etc	2.83
	Simon Nusbaum, postmaster	Rent post-office box	1.50
	Grant Rivenberg	Ice	3.15
	Fred Taylor	Labor and material	5.50
	Robt. F. Holmes & Co	Sulphuric acid	1.44
	Jas. Morrison, jr	Painting instrument shelters	20.00
	Johnson & Johnson	Coal	8.00
	Coe Bros	Ink	2.40
	Ferguson & Cooper	Painting floors	6.00
	Sydney & Hundley	Stool	1.10
	W. H. Ranney	Recasting rollers	3.75
	San Antonio Gas and Electric Co	Electric current	6.25
	Indianapolis Light and Power Co	do	18.00
	Tampa Electric Co	do	5.00
	E. A. Born	do	6.00
	Wm. Caldwell	Repairing rain gauge	.75
	J. R. Wilson & Son	Oil	.75
	J. F. Conrad Grocer Co	Gasoline	1.50
	Yates & Co	Oil	2.15
	P. C. Shaw	Towel service	6.00
	M. J. Greer	do	1.50
	Amelia McLean	do	3.00
	American Linen Supply Co	do	3.00
11	R. A. Fessenden	Office expenses	29.48
	Alfred N. Thiessen	do	12.25
	W. T. Blythe	Traveling expenses	10.45
	T. Collins	do	6.50
	Alex. G. McAdie	do	3.00
	E. T. Turner	do	10.89
	E. C. Hobbs	do	4.50
	Orson Adams, jr	Office rent	120.00
	Ella W. Daniels	do	87.50

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

WEATHER BUREAU—GENERAL EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
Apr. 11	Prudential Building Co	Office rent	$134.96
	Jos. Gussenhoven	do	90.00
	T. M. Jeffris & Co	do	100.00
	Edgar Harding	do	87.50
	Ed. S. Hughs & Co	do	106.11
	Pay roll, Harrisburg, Pa	Substation salaries	70.00
	Pay roll, New Haven, Conn	do	48.00
	Pay roll, Norfolk, Va	do	105.00
	J. W. Branan	Services	15.00
	Reading Paper Mills	Paper	45.00
	The Friedenwald Co	do	32.00
	Geo. Meier & Co	Lithographic varnish	7.00
	Alie Mawhirter	Use of horse	2.50
	United Typewriter and Supply Co	Repairing typewriter	9.75
	H. R. Holman	Repairing clock	1.00
	R. Ganter	do	3.50
	Iowa Telephone Co	Services	13.50
	Chicago Telephone Co	Rent	57.50
	Northwestern Telephone Exchange Co	do	9.00
	Missouri and Kansas Telephone Co	Services	30.00
	New York and Pennsylvania Telephone and Telegraph Co.	do	21.00
	Central Union Telephone Co	do	10.50
	Cumberland Telephone and Telegraph Co.	do	16.50
	do	Rent	10.00
	Southern States Telephone Co	do	9.50
	Southern Bell Telephone and Telegraph Co.	do	7.50
	do	do	13.50
12	Willis L. Moore	Traveling expenses	41.50
13	Ferdinand J. Walz	do	41.50
	W. H. Fallon	Office expenses	1.00
	E. H. Emery	do	13.82
	J. W. Bauer	do	2.25
	L. N. Jesunofsky	do	1.25
	P. McDonough	do	5.57
	G. N. Wilson	do	.30
	Jas. P. Bolton	do	1.00
	Jas. Evans	Services	9.00
	E. J. Kelliher	do	15.00
	Jno. T. Myers	do	15.00
16	Edgar B. Calvert	Traveling expenses	22.50
	Library bureau	Cards	12.50
	Z. D. Gilman	Stopcocks	2.23
	Geo. C. Maynard	Telegraph service	154.59
	J. C. Entwistle	Engraving	7.50
	R. Carter Ballantyne	Pens	16.95
	Richard L. Lamb	Pads	65.00
	National Electrical Supply Co	Leather belting	7.00
	The Maurice Joyce Engraving Co	Electrotype plates	7.86
	Jno. C. Parker	Map paper	313.10
	do	Inkstands, etc	20.40
	Jas. B. Lambie	Steel and brass	73.50
	Michigan Telephone Co	Rent	12.00
	do	do	4.50
	Michigan Telephone Co	do	6.00
	Pacific States Telephone and Telegraph Co.	do	22.50
	do	do	7.50
	do	do	9.00
	Columbia Telephone Co	do	6.00
	do	do	10.50
	Nebraska Telephone Co	Services	12.00
	do	Rent	15.00
	Union Telephone Co	Services	5.00
	The Central District and Printing Telegraph Co.	Rent	34.25
	Cumberland Telephone and Telegraph Co.	do	29.85
	do	do	30.00
	Cumberland Electric Light and Power Co.	Electric current	15.00
	Cumberland Telephone and Telegraph Co.	Rent	12.00
	Southern Bell Telephone and Telegraph Co.	do	17.00
	do	do	7.50
	do	do	10.00
	do	Services	4.50
	do	Rent	15.00
	The Bell Telephone Co. of Buffalo	Services	21.50
	Sunset Telephone and Telegraph Co.	Rent	12.00
	do	do	15.00
	Hudson River Telephone Co	Services	16.50

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

WEATHER BUREAU—GENERAL EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
Apr. 16	The Chesapeake and Potomac Telephone Co.	Rent	$31.25
	East Tennessee Telephone Co	Services	10.50
	Black Hills Telegraph and Telephone Co	do	21.00
	The City and Suburban Telegraph Assn	do	21.00
	New England Telephone and Telegraph Co	do	9.00
	Inter-State Telephone and Telegraph Co	do	4.50
	The Northwestern Telephone Exchange	do	18.00
	Delaware and Atlantic Telegraph and Telephone Co.	Rent	12.00
	Missouri and Kansas Telephone Co	Services	9.00
	Woolford Telephone Co	Rent	5.00
	New York Telephone Co	do	60.00
	Geo. W. Finch	Services	6.00
	M. T. Hayden	Washing towels	3.00
	F. C. Nunemacher	Paper	5.00
	Gamble & Ludwig	Gasoline	.65
	United Electric Light and Power Co	Electric current	24.00
	H. Overholser	Office rent	127.50
	Roy G. Lewis	do	5.00
	Lorenzo Littlefield	do	64.99
	Albert Marty	do	165.00
	Pacific Club	do	67.50
	American Surety Co. of New York	do	625.00
	Henry Bolton	do	52.84
	Real Estate and Law Building Co	do	43.75
	Northwestern Mutual Life Insurance Co	do	124.00
	Jas. L. Connell	do	118.75
	Jno. G. Brown	do	75.00
	H. H. Taylor, agent	do	322.50
	Portland Trust Co. of Oregon	do	210.00
	M. E. Conway	do	37.74
	City of Palestine, Tex	do	78.50
	Adam Geiger	do	60.00
	C. S. McLaury et al	do	69.00
	Warfield & Dann	do	75.00
	Lucke & Smith	do	75.00
	B. S. Williams	do	73.00
	J. L. Manning	do	59.32
	Margaret Parmentier	do	75.00
	Jno. Semer	do	114.00
	Lake Shore and Michigan Southern Rwy. Co.	Transportation	3.57
	Lower Coast Packets	do	.50
	New Bedford, Marthas Vineyard and Nantucket Steamboat Co.	do	.65
	New York, Chicago and St. Louis R. R. Co	do	.82
	Wisconsin Central R. R. Co	do	.18
	W. T. Cain	do	1.00
	Star Union Line	do	.45
	The Utah and Pacific R. R. Co	do	7.45
	The Oregon Short Line R. R. Co	do	2.05
	San Antonio and Aransas Pass Rwy. Co	do	.95
	Pennsylvania R. R. Co	do	1.25
	Baltimore and Ohio R. R. Co	do	.74
	Cincinnati, New Orleans and Texas Pacific Rwy. Co.	do	.82
	Michigan Central R. R. Co	do	1.37
	do	do	.63
	St. Louis and Santa Fe R. R. Co	do	2.93
	do	do	.91
	Duluth and Iron Range R. R. Co	do	1.09
	Duluth, South Shore and Atlantic Rwy. Co	do	1.38
	Cleveland, Cincinnati, Chicago and St. Louis Rwy Co.	do	2.68
17	Chas. P. Meekins	Rent of ground	7.85
	The First National Bank of Moorhead	Office rent	66.31
	W. D. Grant	do	225.00
	Estate of Isaac Eberly	do	154.00
	Bank and Insurance Building Co	do	100.00
	Jas. K. Porter	do	150.00
	Kate F. Coke	do	60.00
	H. S. Gilbert Co., treasurer	do	67.00
	Geo. S. Waite	do	119.82
	The Marquette County Savings Bank	do	90.00
	Union Trust Building Co., Ltd	do	167.50
	Homer W. Styron	do	38.62
	Mary E. Shelden	do	93.75
	Amarillo Improvement Co	do	30.00
	Mill Valley and Mount Tamalpais Scenic Rwy.	do	105.00

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

WEATHER BUREAU—GENERAL EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
Apr. 17	Alfred H. Thiessen	Traveling expenses	$4.25
	C. E. Hasse	do	4.25
	E. C. Hobbs	do	3.15
	Norman B. Conger	do	4.00
	L. H. Murdock	do	9.35
	E. C. Hobbs	do	84.50
	E. D. Beattie	Printing crop report	36.00
	R. H. Vorpahl	do	70.00
	E. L. Bristol	Printing monthly bulletins	12.00
	Arizona Publishing Co	do	63.00
	M. A. Graham	Washing towels	1.50
	C. W. Byrnes	do	3.00
	J. F. Beck	do	3.00
	Mary Fantleroy	do	1.50
	R. C. Warriner	do	3.00
	Nashville Laundry Co	do	1.80
	Omaha Towel Co	do	3.00
	The American Toilet Supply Co	do	2.25
	Baltimore Towel Supply Co	do	2.25
	Vicksburg R. R. Power and Manufacturing Co.	Electric current	9.00
	H. L. Pittock	do	18.00
	Thos. W. Pemberton	do	5.10
	Minnesota International Electric Co	do	15.00
	Edison Sault Electric Co	do	16.40
	Sprague Electric Co	do	15.00
	The Electric Co	do	4.65
	Charleston Consolidated Rwy., Gas, and Electric Co.	do	3.00
	Georgetown Electric Co	do	6.75
	Fort Wayne Electric Works	Supplies	33.00
	Hoke Engraving Plate Co	Recording plates	25.00
	do	Stereotype metal	11.60
	Nashville Gas Co	Gas	11.50
	Buffalo Gas Co	do	8.00
	The Portland Gas Co	do	11.70
	New Orleans Gaslight Co	do	17.62
	People's Gaslight and Coke Co	do	7.00
	J. S. Allen	Labor and material	25.00
	W. H. H. Smith	Use of horse and wagon	9.00
	do	Use of team	35.25
	W. J. May	Services and material	15.80
	O. W. Morey	Cleaning clock	1.00
	J. J. Letron	Repairs to instrument shelter	13.50
	Alex. J. Pollock	Repairs to rain gauge	.75
	Valley Paper Co	Paper	62.50
	Chas. Bond	Rawhide belt	3.72
	Addressograph Co	Addressograph	6.24
	Jas. G. Biddle	Volt meter	10.50
	do	Batteries, etc	180.00
	Barnhart Bros. & Spindler	Iron chase, etc	1.71
	Jno. A. Brashear	Prism	170.00
	S. H. Bowers	Repairs to instrument shelters	1.25
	Fels. Solis	Flagstaff	3.50
	Board of Public Works, Sault Ste. Marie	Water	3.50
	McEwin & Lanyer	Wood	7.84
	Chase Paint and Oil Co	Benzine	3.00
	F. C. Nunemacher	Printing summary	93.00
	Henry Munson	Cleaning rugs	3.00
	Samuels Transfer and Storage Co	Drayage	1.00
	McCormick & Bates	Cartage	.25
	Pacific Transfer Co	Hauling	22.76
	Santa Fe, Prescott and Phœnix Rwy. Co	Passenger transportation	14.40
18	Western Union Telegraph Co	Telegraph service	13,482.39
	Baltimore and Ohio R. R. Co	Passenger transportation	12.75
	Lake Shore and Michigan Southern Rwy. Co.	do	18.50
	Chesapeake and Ohio Rwy. Co	do	16.00
	California Northwestern Rwy. Co	do	9.00
	Atlantic and North Carolina R. R. Co	do	2.40
	Galveston, Houston and Northern Rwy. Co.	do	37.30
	Norfolk and Southern Rwy. Co	do	4.90
	L. Rogers	Services	15.00
	Marcos Sanchez	do	15.00
	H. F. Barnett	Rent of land	4.88
	Chicago, Burlington and Quincy R. R. Co	Telegraph services	2.59
	Georgia Telephone and Telegraph Co	Rent	10.00
	Southwestern Telegraph and Telephone Co	do	9.00
	Meridian Telephone Co	Services	6.00

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

WEATHER BUREAU—GENERAL EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
Apr. 18	East Tennessee Telephone Co	Rent	$9.00
	Southern Bell Telephone and Telegraph Co	Services	8.25
	Michigan Telephone Co	Rent	6.00
	The Bell Telephone Co. of Missouri	do	16.25
	E. A. Hughes	Electric light	9.00
	Peninsular Electric Light and Power Co	Electric light, etc	6.70
	Asa Church	Repairs to telegraph lines	3.00
	Western Union Telegraph Co	do	20.07
	J. W. Holmes	do	7.50
	McCay Engineering Co	Repairing electric wire	3.60
	Mill Valley and Mount Tamalpais Scenic Rwy. Co.	Cleaning office	15.00
	Dietrich Bros	Erecting towers	78.50
	R. Y. Conrad	Repairing typewriter	1.50
	Robt. Oliver	Wind vane	5.00
	C. B. Little	Water	11.00
	Consumers' Ice Co	Ice	3.85
	Gethers & Dreberk Co	Printers' supplies	10.70
	E. C. Sollers	Use of team	23.00
	L. Rogers	Use of horse and cart	30.00
	Statesmen Printing Co	Printing bulletins	76.50
	Dora Moyen	Washing towels	6.00
	do	do	6.00
	Geo. M. Hubinger	Towel service	3.00
	Kentucky Steam Laundry	do	1.50
	H. Brooker & Co	Kerosene oil	4.44
	N. S. McGee & Co	Coal	7.00
	Smith, Walker & Co	Coal oil	.80
	Standard Oil Co	do	7.56
	W. U. Simons	Office expenses	3.25
	U. G. Purssell	do	1.15
	W. S. Palmer	do	1.25
	C. E. Hesse	do	57.50
	do	do	4.50
	Jas. Keneally	Traveling expenses	55.40
	C. E. Hesse	do	14.20
	G. W. Felger	do	8.75
	A. Zappone	do	21.50
19	Universal Supply Co	Ink	22.50
	Harry Heilshorn	Painting shelters	2.00
	California Truck Co	Hauling	2.25
	P. H. Lannan	Printing bulletins	16.00
	Jas. F. Marek	do	11.00
	Flint & Walling Manufacturing Co	Express charges	3.55
	Wm. Roney	Telephone rent	6.00
	Michigan Telephone Co	do	11.25
	Duluth Telephone Co	do	12.50
	Southwestern Telegraph and Telephone Co	Telephone services	9.00
	The Northwestern Telegraph Exchange	Telephone rent	18.00
	R. L. Lewis	Telephone services	20.25
	Pacific States Telegraph and Telephone Co	Telephone rent	18.00
	Southern Bell Telegraph and Telephone Co	do	7.50
	do	Telephone services	7.50
	Standard Gas and Electric Co	Gas	12.00
	Raleigh Electric Co	Electricity	5.22
	Lincoln Traction Co	do	13.50
	Bank of Tehama County	Office rent	99.06
	Jos. Bryan	do	150.00
	Catherine Wilson	do	140.82
	Chamber of Commerce Building Co	do	93.21
	Fanny L. Keating	do	90.00
	W. M. Wilson	Office expenses	9.13
	W. M. Dudley	do	1.75
23	Pay roll, Portland, Oreg	Substation, salaries	65.00
	Pay roll, New York, N. Y	do	35.00
	Pay roll, Shreveport, La	do	38.84
	Pay roll, Vicksburg, Miss	do	87.00
	Pay roll, Philadelphia, Pa	do	38.52
	Pay roll, Augusta, Ga	do	57.00
	Pay roll, Atlanta, Ga	do	114.00
	Pay roll, Charleston, S. C	do	67.00
	do	do	18.00
	Pay roll, Pensacola, Fla	do	36.00
	Pay roll, Wilmington, S. C	do	72.00
	Chas. P. Blackly	Services	9.00
	N. W. Wagner	do	21.00
	W. T. Turbeville	do	15.00
	B. F. Modisett	do	30.00
	Thos. A. Boon	do	30.00
	Una V. Hendrix	do	21.00
	C. P. Disney	do	7.00

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

WEATHER BUREAU—GENERAL EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
Apr. 23	R. W. Clement	Services	$10.10
24	Ch. Ebbighausen	do	4.25
	D. F. Webber	do	4.25
	L. C. Ballard	do	4.25
	D. Frank Thompson	do	4.25
	Pay roll, Cincinnati, Ohio	Substation, salaries	186.00
	Pay roll, La Crosse, Wis	do	63.00
	Alex. G. McAdie	Office expenses	1.65
	Geo. E. Grimes	do	.75
	Geo. E. Franklin	do	3.70
	W. E. Hartwig	Traveling expenses	9.35
	Ernst T. Giers	do	9.85
	Fred. A. Schmidt	Relief maps	720.00
	do	Packing maps	58.00
	Jas. B. Lambie	Machine screws	1.04
	Richd. L. Lamb	Dating stamps	10.80
	Robt. B. Caverly	Repairs to faucet	1.50
	The Maurice Joyce Engraving Co	Engraving plates	6.50
	R. Carter Ballantyne	Paper	64.50
	The Cleveland Telephone Co	Rent	18.00
	Western Union Telegraph Co	Repairs	11.10
	Flint & Walling Manufacturing Co	Signal towers	408.00
	J. P. Nawrath	Sponges	9.90
	Meteorological Council	Compilation of telegrams	8.88
	Paine Bros	Office rent	73.95
	Tacoma Chamber of Commerce and Board of Trade.	do	60.00
	Society of Savings	do	285.00
	Southern Rwy. Co	Transportation	3.54
26	Norfolk and Southern R. R. Co	Passenger transportation	2.90
	Barnhart Bros. & Spindler	Brass rule	4.20
	do	Supplies	1.15
	Wisconsin Telephone Co	Service	18.00
	The Colorado Telephone Co	Rent	13.50
	Sunset Telephone and Telegraph Co	do	6.00
	People's Telephone and Telegraph Co	do	7.50
	East Tennessee Telephone Co	do	9.00
	The Colorado Telephone Co	do	22.50
	F. G. Blaisdell	Telephone service	8.63
	do	Water	9.00
	Consolidated Gas Co	Gas	1.54
	M. O'Connor	Sevices	10.00
	The Silver States Towel Supply Co	Towel service	2.25
	Jas. G. Biddle	Ammeter	27.50
	Port Royal Dock Co	Coal	17.12
	Wild & Stevens	Printing supplies	3.60
	Eimer & Amend	Glass tubing, etc	17.74
	The Model Drug and Jewelry Co	Cleaning clock	1.50
	Carter, Rice & Co. (corporation)	Paper	56.00
	Mill Valley and Mount Tamalpais Scenic Rwy.	Laying cable	14.00
	G. B. Chadwick & Co	Erecting tower	50.00
	Emma Ling	Cleaning office	10.00
	E. L. Page	Hauling	5.75
	Adelbert A. Bolles	do	6.00
	A. E. Hackett	Office expenses	4.70
	Edw. A. Beals	do	3.35
	L. M. Tarr	do	9.50
	P. H. Smyth	do	1.75
	Eliz L. Renoe	do	4.25
	W. T. Blythe	do	11.95
	C. F. R. Wappenhaus	do	3.90
	Geo. M. Chappel	Traveling expenses	5.75
	Chas. E. Holmes	do	14.70
27	Houston and Texas Central R. R. Co	Passenger transportation	27.06
	do	do	23.45
	Hocking Valley Rwy. Co	do	5.00
	Delaware, Lackawanna and Western R. R. Co.	do	7.00
	Illinois Central R. R. Co	do	13.20
	Michigan Central R. R. Co	do	12.89
	The Missouri Pacific Rwy. Co	do	24.80
	Norfolk and Southern Rwy. Co	do	1.45
	Chicago Milwaukee and St. Paul Rwy. Co	do	12.45
	Fort Worth and Denver City Rwy. Co	do	23.70
	Staunton Mutual Telephone Co	Telephone service	37.50
	Cumberland Telephone and Telegraph Co	do	44.50
	Alabama, Mississippi and Tennessee Telephone Co.	do	6.50
	Alabama and Georgia Long Distance Telephone Co.	do	16.80

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

WEATHER BUREAU—GENERAL EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
Apr. 27	East Tennessee Telephone Co	Telephone service	$31.00
	Barron County Telephone Co	do	15.00
	Almo Telephone Co	do	6.00
	Minneapolis, St. Paul and Sault Ste. Marie Rwy. Co.	do	22.61
	W. H. Holmes	Telegraph service	6.00
	Dakota Central Telephone Lines	Telephone service	155.61
	Corvallis and Eastern R. R. Co	Telegraph service	2.60
	Rocky Mountain Bell Telephone Co	Telephone service	14.08
	Rising Sun Telephone Co	do	2.60
	Josie G. Smith	Services	7.00
	Geo. F. Lozier	do	12.00
	Jno. Stack	Painting	10.00
	Geo. Draper	Iron stovepipe	.95
	Jas. Hunter	Services	4.50
	W. H. Smith	Use of team	19.50
	Isaac Quinn	Services	1.50
	H. J. Ledoux	Abita water	3.24
	Sunset Photo. Engraving Co	Half-tone plates	12.60
30	W. F. R. Phillips et al	Salaries	272.00
	B. F. Larcombe et al	do	2,752.98
May 2	Pay roll, Cairo, Ill	Substation, salaries	121.95
	Pay roll, Chattanooga, Tenn	do	163.70
	Pay roll, Baltimore, Md	do	45.00
	Pay roll, Portland, Oreg	do	75.00
	Pay roll, New Orleans, La	do	84.00
	Albert Brand	Office expenses	59.97
	T. S. Outram	do	3.28
	A. Zappone	Traveling expenses	10.75
	J. W. Gorman	Services	8.00
	Michigan Telephone Co	do	6.00
	A. L. Foster	do	20.00
	Miami Telephone Co	do	3.01
	Cumberland Telephone and Telegraph Co.	Rent	21.00
	Barnhart Bros. & Spindler	Type	10.94
	Chas. Eneu Johnson & Co	Lithographing ink	107.50
	J. Baumgarten & Sons	Rubber stamps	.84
	do	do	2.48
	W. H. Renear	Use of horse and wagon	2.00
	Clarke & Co	Copyholder	2.00
	Jno. C. Parker	Letter press, etc	16.50
	do	Pins	3.52
	R. Carter Ballantyne	Paper	24.00
	Jas. B. Lambie	Wire rope	3.00
	Broderick Bros	Rags	14.00
	Standard Oil Co	Oil	5.83
3	Pay roll, Little Rock, Ark	Substation, salaries	9.00
	do	do	42.00
	A. J. Mitchell	Office expenses	3.35
	S. L. Dosher	do	10.50
	W. M. Fulton	do	5.25
	Jos. Sands	do	1.00
	E. B. Richards	do	10.75
	W. S. Beldin	do	7.31
	Wm. G. Burns	do	2.40
	R. G. Allen	do	14.60
	T. J. Walz	Traveling expenses	13.50
	D. C. Grunow	do	6.20
	Edw. A. Beals	do	46.25
	New York and Pennsylvania Telephone and Telegraph Co.	Telephone rent	6.75
	Southern Bell Telephone and Telegraph Co.	do	12.00
	Geo. Meier & Co	Gum arabic	2.20
	American Type Founders Co	Staples	25.00
	Danl. W. King	Towel service	3.75
	Hoke Engraving Plate Co	Recoating plates	62.50
	do	Stereotype metal	11.00
	do	Recoating plates	62.50
6	Pay roll, Montgomery, Ala	Substation salaries	149.00
	Pay roll, Mobile, Ala	do	71.25
	Pay roll, Savannah, Ga	do	61.00
	Pay roll, Parkersburg, W. Va	do	136.50
	Pay roll, Pittsburg, Pa	do	304.00
	F. H. Clarke	Traveling expenses	4.00
	B. S. Pagne	do	23.00
	J. C. Piercy	Office expenses	1.00
	E. C. Vose	do	6.92
	Robt. G. Gillum	Services	9.00
	H. G. Lichty	Cleaning office	3.50

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

WEATHER BUREAU—GENERAL EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
May 6	Otto Gunderson	Cleaning carpets, etc	$5.00
	Western Union Telegraph Co	Services	137.49
	Flint and Walling Manufacturing Co	Steel flagstaff	22.75
9	Wm. Lory	Services	14.84
	M. M. Laidley	do	21.00
	Johnston Barrett	do	2.00
	Pay roll, Fort Smith, Ark	Substation salaries	39.00
	Pay roll, Raleigh, N. C	do	83.00
	Pay roll, Nashville, Tenn	do	58.70
	Pay roll, Jacksonville, Fla	do	75.00
	Pay roll, St. Louis, Mo	do	122.05
	C. F. Marvin	Traveling expenses	11.80
	Chas. V. Richey	do	8.25
	Improvement Loan and Trust Co	Office rent	150.00
	Simon W. Everitt	do	8.00
	Frank D. Miracle	do	105.00
	Ohio River Telephone Co	Telephone service	5.20
	Rocky Mountain Bell Telephone Co	Telephone rent	9.00
	Sunset Telephone and Telegraph Co	do	15.00
	New England Telephone and Telegraph Co	do	14.25
	W. B. Moses and Sons	Desk, etc	55.00
	Wm. H. Dyer	Sawdust	1.75
	M. Du Perow	Wire	6.00
	J. W. Jordan & Co	Milliograph roller	10.50
	W. G. Duckett	Palm oil	.40
	The Maurice Joyce Engraving Co	"Fog studies," etc	13.23
	M. G. Copeland & Co	Flags	51.95
	Mackall Bros	Glycerin	3.35
	United Typewriter and Supplies Co	Platen	2.00
	Johnson & Johnson	Wood	1.80
	Robt. D. Willson	Heater, etc	18.00
	W. R. Prowell	Repairing rain gauge	5.00
	F. D. Day & Co	Repairing clock	2.00
	J. H. McInnes	Repairing office	9.00
	American Type Founders Co	Logotypes	5.50
	National Electrical Supply Co	Installing electric generator	3,960.00
	Robt. Tyler	Printing bulletins	12.50
	A. B. Wood	Washing towels	3.00
	Oregon Short Line R. R. Co	Passenger transportation	37.50
	Norfolk and Washington, D. C., Steamboat Co.	do	3.00
	Galveston Gas Co	Gas	18.45
	Max Levy	Electric current	30.00
10	Chas. M. Strong	Office expenses	2.00
	G. N. Salisbury	do	6.32
	J. B. Marbury	do	1.25
	C. P. Cronk	do	4.00
	S. M. Blandford	do	9.60
	Orris W. Roberts	do	1.50
	I. M. Cline	do	6.15
	R. J. Hyatt	do	4.50
	R. A. Fessenden	Traveling expenses	29.55
	W. M. Wilson	do	5.14
	Pay roll, Harrisburg, Pa	Substations salaries	14.00
	Pay roll, Boston, Mass	do	691.50
	Pay roll, New Orleans, La	do	52.50
	Wm. Hengerier	Linoleum	4.90
	do	Laying carpet	4.25
	Peter Gray	Lanterns	2,177.00
	Norwich University	Heat and light	12.00
	do	do	12.00
	Geo. Draper	Coal oil	5.85
	Geo. Watts	Running cable	3.00
	W. E. Saffold	Repairing clock	1.50
	The Kelleys Island Line and Transport Co	Services	3.50
	Allen Carpet Cleaning Co	Cleaning rug	1.70
	Potter Bros	Pulley blocks	1.20
	C. F. Hammond, postmaster	Stamps	1.62
	Southwestern Telegraph and Telephone Co.	Service	12.00
	Cumberland Telephone and Telegraph Co	do	144.30
	The Central District and Printing Telegraph Co.	do	18.00
11	Pay roll, Galveston, Tex	Substation salaries	30.00
	Pay roll, New York, N. Y	do	35.00
	Pay roll, Portland, Me	do	75.00
	Yates & Co	Benzine	1.00
	Philip Lindemeyer	Pad ink	18.00
	Simon W. Everitt	Office rent	8.00
	Fred Springmann	Transportation	5.98

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

WEATHER BUREAU—GENERAL EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
May 11	Fred Springmann	Transportation	$12.93
13	United States Express Co	do	35.47
	do	do	31.94
	Adams Express Co	do	60.35
	do	do	48.87
	do	do	9.30
	do	do	29.86
	do	do	18.56
	do	do	14.93
	Seth Schell	Repairing river gauge	5.00
17	Willis L. Moore	Traveling expenses	12.65
	Fredk. Springmann	Transportation	12.14
21	Queen & Co., Incorporated	Induction coil	200.00
	Potter Bros	Padlock	1.40
	Ray Munroe	Use team, etc	10.25
	Honeyman, DeHart & Co	Iron wire, etc	11.55
	The VanBibber Roller Co	Casting rollers, etc	4.00
	M. Cotter	Wood	5.58
	P. H. Cheney & Sons	Lantern support	9.50
	C. H. Davidson	Carpet sweeper	2.00
	The First National Bank	Office rent	126.00
	Jas. G. Biddle	Pulley	2.45
	W. W. Griggs & Son	Gasoline, etc	2.00
	Chippewa Hardware Co	Brooms	.90
	Seneca Falls Manufacturing Co	Lathe tool, etc	.48
	do	Lathe tools, etc	177.79
	Flint & Walling Manufacturing Co	Storm warning towers	86.55
	East Florida Printing Co	Printing bulletins	39.00
	E. D. Beattie	do	36.00
	Statesman Printing Co	Printing annual summary	44.00
	Bennett Printing House	Printing bulletins	20.00
	Joseph F. Marek	do	13.75
	G. H. Boughman	Binding reports	1.75
	W. N. McPhail	Binding forms	.75
	E. F. Ruff	Washing towels, etc	.95
	Fred. Bamford & Co	Painting instrument shelter	7.50
	W. J. Beck	Repairing instrument shelter	3.00
	A. J. Jackson	Erecting instrument shelter	8.00
	W. H. Smith	Use team	58.00
	Sunset Telephone and Telegraph Co	Rent telephone	4.00
	North Montana Telephone Co	Telephone services	21.40
	Pacific States Telephone and Telegraph Co	Telephone rent	25.50
	Alabama and Georgia Long Distance Telephone Co.	Telephone service	14.80
	Aurora and Friendship Telephone Line	do	7.80
	Pacific States Telephone and Telegraph Co	do	.80
	Isle of Wight Telephone and Telegraph Co	Telegraph service	5.00
	Pacific States Telephone and Telegraph Co	do	2.60
	Winton Telegraph Co	do	7.50
	Jacksonville and St. Johns Bar Telegraph Line.	do	8.50
	Philadelphia, Reading and Pottsville Telegraph Co.	do	10.77
	Enterprise Telegraph Co	do	12.70
	Minneapolis, St. Paul and Sault. Ste. Marie Rwy. Co.	do	9.23
	International Ocean Telegraph Co	do	260.79
	Western Union Telegraph Co	do	149.27
	Pay roll, Galveston, La	Substation salaries	27.00
	Pay roll, Richmond, Va	do	6.50
	Pay roll, Atlanta, Ga	do	14.00
	Pay roll, Montgomery, Ala	do	30.50
	Alfred H. Thiessen	Office expenses	29.00
	E. R. Demain	do	16.00
	J. C. Hayden	do	1.25
	Frank Jermin	Traveling expenses	12.25
	Alfred H. Thiessen	do	6.25
	W. W. De Lano	Services	5.00
	Lizzie A. Chidester	do	9.00
23	R. P. Clarke & Co	Millinet	1.75
	Michael O'Leary	Sand	1.50
	Library Bureau	Oak cases	8.00
	Norfolk and Washington Steamboat Co	Transportation	7.35
	Mittag & Volger	Carbon paper	138.00
	Jas. B. Lambie	Files, etc	32.42
	Geo. F. Muth & Co	Draftsmens' pins	2.40
	Lawyer & Wagner	Camera	25.20
	Union Typewriter and Supplies Co	Platen, etc	2.40
	J. Edw. Turton	Anemometer	17.50
	Wm. H. Dyer	Cherry strips	17.40

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

WEATHER BUREAU—GENERAL EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
May 23	Mackall Bros	Paraffin	$5.20
	Fred A. Schmidt	Drawing paper	6.21
	National Electrical Supply Co	Knife, etc	1.40
	E. B. Calvert	Traveling expenses	4.85
	Postal Telegraph Cable Co	Telegraph service	34.08
	do	do	236.19
	United States Express Co	Transportation	.92
	Standard Oil Co	Benzine	6.89
	Southern Rwy. Co	Passenger transportation	2.64
	do	do	37.95
	do	Transportation	18.19
29	Pere Marquette R. R. Co	do	5.27
	do	do	2.93
	do	do	.78
	do	do	2.67
	Mohawk and Malone R. R. Co	do	.96
	Boston and Albany R. R. Co	do	.94
	Boston and Maine R. R. Co	do	.65
	Fremont, Elkhorn and Missouri Valley R. R. Co.	do	2.22
	Michigan Central R. R. Co	do	.87
	St. Louis and San Francisco R. R. Co	do	13.22
	Savannah and Florida Western R. R. Co	do	6.66
	Virginia and Truckee R. R. Co	do	.95
	Wisconsin Central Rwy. Co	do	.18
	Richmond, Fredericksburg and Potomac R. R. Co.	do	.25
	do	do	.26
	do	do	.59
	Mobile and Ohio R. R. Co	do	6.50
	St. Louis and North Arkansas R. R. Co	do	.40
	New York Central and Hudson River R. R. (lessee).	do	7.29
	Wisconsin Central Rwy. Co	do	.33
	Cincinnati, Hamilton and Dayton Rwy. Co	do	.59
	Ulster and Delaware R. R. Co	do	.77
	International and Great Northern R. R. Co.	do	3.08
	The Hocking Valley Rwy. Co	do	.51
	Arnold Transportation Co	do	1.62
	Lake Erie and Western R. R. Co	do	.51
	Chicago and Northwestern Rwy. Co	do	8.00
	do	do	4.60
	do	do	2.61
	do	do	.78
	Missouri Pacific Rwy. Co	do	1.92
	do	do	.40
	do	do	11.28
	Harry E. Overstreet	do	.38
	do	do	.50
	Star Union Line	do	.65
	do	do	11.63
	Drain Coos Bay Stage Co	do	1.10
	Central R. R. Co. of New Jersey	do	19.04
	do	do	.35
	Cleveland, Cincinnati, Chicago and St. Louis Rwy. Co.	do	4.47
	do	do	4.61
	Chesapeake and Ohio Rwy. Co	do	.57
	do	do	13.37
	do	do	12.71
	Chicago, Rock Island and Pacific Rwy. Co	do	.91
	do	do	1.14
	do	do	1.32
	Chicago, Milwaukee and St. Paul Rwy. Co	do	2.98
	do	do	1.04
	do	do	.92
	do	do	.84
	do	do	1.89
	Louisville, Evansville and St. Louis Consolidated R. R. Co.	do	1.23
	do	do	2.85
	Louisville and Nashville R. R. Co	do	.92
	do	do	10.05
	do	do	3.19
	do	do	.56
	Chicago, Burlington and Quincy R. R. Co	do	.87
	Galveston, Houston and Northern Rwy. Co.	do	4.31
	Grand Rapids and Indiana Rwy. Co	do	.69
	do	do	.57
	The Colorado Southern Rwy. Co	do	.60

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

WEATHER BUREAU—GENERAL EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
May 29	Delaware and Hudson Co	Transportation	$17.65
	do	do	1.59
	New York Central and Hudson River R. R. Co.	do	2.50
	New York, Ogdensburg and Watertown Rwy. Co.	do	.45
	Norfolk and Southern R. R. Co	do	.72
	do	do	.75
	Queen Anne's R. R. Co	do	.65
	San Antonio and Aransas Pass Rwy. Co	do	1.55
	Illinois Central R. R. Co	do	.74
	do	do	2.32
	Pennsylvania R. R. Co	do	1.31
	do	do	.60
	do	do	.69
	do	do	6.22
	do	do	4.51
	do	do	1.68
	do	do	.37
	do	do	.35
	do	do	.42
	do	do	.50
	do	do	.35
	do	do	1.86
	do	do	1.12
	do	do	.84
	do	do	.77
31	W. F. R. Phillips et al	Salaries	281.00
	B. F. Larcombe et al	do	2,698.85
	P. S. Pagne	Office expenses	21.75
	Ohio River R. R. Co	Telegraph services	2.40
	Peoples' Telephone Co	Telephone services	5.00
	Chicago, Burlington and Quincy R. R. Co	Telegraph services	2.76
	Cincinnati, Hamilton and Dayton R. R. Co	Passenger transportation	6.00
	Oregon Short Line R. R. Co	do	19.75
	Pennsylvania R. R. Co	do	16.50
	Southern Pacific Co	do	9.10
	Universal Supply Co	Ink	2.50
	The Oregon R. R. and Navigation Co	Passenger transportation	42.40
	Chesapeake and Ohio Rwy. Co	do	55.20
	Geo. Meier & Co	Litho varnish	16.25
	Geo. B. Wurtz	Traveling expenses	6.00
	C. B. Wentzell	Services	4.00
	J. S. Hazen	Office expenses	1.00
	J. W. Smith	Traveling expenses	1.35
	Boston and Maine R. R. Co	Passenger transportation	2.80
	Northern Pacific Rwy. Co	do	52.30
	Union Pacific R. R. Co	do	43.68
	G. E. Stechert	London Electrician	6.75
	The J. F. W. Dorman Co	Rubber type	257.33
	do	do	25.49
	do	Paper bags	4.65
	Atlantic Coast Line R. R. Co	Passenger transportation	6.20
	H. C. Bate	Traveling expenses	6.95
	Alfred H. Theissen	Office expenses	38.00
	do	do	32.25
	R. A. Fessenden	do	20.79
	Pay roll, Boston, Mass	Substations salary	36.75
	Jno. A. Richards, deceased	Services	30.48
	Zetta Higgins	do	30.00
	Meteorological Council	Compilations of telegrams	3.77
	Julien P. Friez	Repairs to anemometers	375.00
	Schneider Bros	Kid skins, etc	11.00
	The Friedenwald Co	Paper wrappers	280.56
June 1	The Maurice Joyce Engraving Co	Electrotype plates	54.45
	do	Logotypes	44.00
	Union Typewriter and Supplies Co	Platen	2.00
	National Electrical Supply Co	Tape	7.00
	Broderick Bros	Rags	14.00
	J. C. Entwistle	Engraving	7.50
	Wm. Ballantyne & Sons	Trigonometric tables	3.00
	Jas. B. Lambie	Wrenches, etc	14.55
	do	Auger, etc	.95
	Jno. C. Parker	Cardboard	290.40
	do	Paper	1,658.20
	do	Letter press	22.72
	Standard Oil Co	Oil	5.72
	Jno. J. Games	Traveling expenses	4.85
	J. W. Smith	do	7.85
4	Star Union Line	Transportation	.45

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

WEATHER BUREAU—GENERAL EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
June 4	Star Union Line	Transportation	$0.54
	do	do	.64
	do	do	1.86
	do	do	3.28
	Lake Shore and Michigan Southern Rwy. Co.	do	4.93
	do	do	.74
	do	do	.42
	Wabash R. R. Co	do	3.14
	do	do	1.01
	do	do	5.09
	Illinois Central R. R. Co	do	.27
	do	do	2.04
	do	do	.21
	do	do	.27
	do	do	.61
	do	do	.92
	do	do	.62
	do	do	.95
	do	do	.66
	do	do	.16
	do	do	.71
	do	do	.37
	do	do	1.21
	The Atchison, Topeka and Santa Fe Rwy. Co.	do	9.96
	do	do	38.38
	Pennsylvania Co	do	.37
	do	do	.42
	Choctaw, Oklahoma and Gulf R. R. Co	do	1.39
	Hannibal and St. Joseph R. R. Co	do	.84
	Goodell & Gray	do	1.00
	Chicago, Indianapolis and Louisville Rwy. Co.	do	.37
	Cleveland, Lorain and Wheeling Rwy. Co	do	.48
	Columbia Southern Rwy. Co	do	.89
	Steamer G. W. Danielson	do	.94
	Erie R. R. Co	do	.50
	Fremont, Elkhorn and Missouri Valley R. R. Co.	do	.54
	Lehigh Valley R. R. Co	do	.90
	Steamboat Burnside	do	1.00
	Goodrich Transportation Co	do	6.75
	F. W. Vogler	do	3.00
	Chattanooga, Rome and Southern R. R. Co.	do	.62
	Florida East Coast Rwy. Co	do	29.16
	Kansas City, Fort Scott and Memphis R. R. Co.	do	6.52
	Pittsburg, Cincinnati, Chicago and St. Louis Rwy. Co.	do	.57
	Pittsburg and Western Rwy. Co	do	.77
	The Rio Grande Western Rwy. Co	do	7.94
	Saranac and Lake Placid R. R. Co	do	1.21
	Norfolk and Western Rwy. Co	do	.55
	Peninsular and Occidental S. S. Co	do	2.75
	Nashville, Chattanooga and St. Louis Rwy. Co.	do	1.64
	do	do	4.85
	Duluth, South Shore and Atlantic Rwy. Co	do	.78
	do	do	1.27
	Savannah, Florida and Western Rwy. Co	do	.69
	Terre Haute and Indianapolis R. R. Co	do	.37
	Pay roll, San Francisco, Cal	Substation salaries	21.75
	Homer R. Plough	Services	4.76
	C. B. Wentzell	do	2.25
	H. B. Hersey	Traveling expenses	4.70
	I. M. Cline	do	13.25
	G. R. Oberholzer	do	8.25
	W. J. Olds	do	3.00
	Ed. A. Beals	do	42.70
	Lucius A. Welsh	do	2.00
	E. B. Richards	Office expenses	7.50
	Fred. J. Gosewisch	do	.50
	D. P. McCallum	do	1.25
	F. H. Brandenburg	do	8.30
	Jas. Keneally	do	.75
	Howard K. Holcomb	do	2.50
	Geo. B. Wurtz	do	1.25
	Chicago, Rock Island and Pacific Rwy. Co.	Passenger transportation	5.76
	Baltimore and Annapolis Short Line R. R. Co.	do	1.25

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

WEATHER BUREAU—GENERAL EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
June 4	Chesapeake and Ohio Rwy. Co	Passenger transportation	$17.00
	Galveston, Houston and Northern Rwy. Co	do	14.40
	Pennsylvania Company	do	11.00
	Southern Pacific Co	do	21.75
	Memphis, New Orleans and Cincinnati Packet Co.	do	10.00
	Baltimore and Ohio R. R. Co	do	21.00
	Pittsburg and Cincinnati Packet Co	do	7.00
	J. W. Mullen	Drayage	1.50
	E. H. Westover	Hauling	10.00
	Jos. F. Marek	Printing bulletins	5.50
	E. D. Beattie	do	36.00
	Dunn & Lemmon	do	12.00
	Vicksburg Herald	Binding reports	3.00
	The Engels Marshall Myers Co	Cleaning carpets	2.70
	W. G. Bennett	Painting, etc	9.50
	L. J. Beatty	Repairing, etc	2.25
	A. Wilson	Repairing clock,	2.00
	P. Benedick	Repairing desk, etc	2.50
	Universal Supply Co	Ink	11.00
	C. D. Stewart	Services and material	4.00
	Flint & Walling Manufacturing Co	Angle irons and bolts	4.50
	The Storage Battery Supply Co	Hydrometer, etc	1.85
	Eimer & Amend	Glass tubing, etc	19.87
	Julien P. Friez	Repairs to instruments	42.50
	Jas. G. Biddle	Galvanometer mirrors	8.20
	B. F. Barnes Co	Drill	48.00
	The J. M. Carpenter Tap and Die Co	Plughead tap	.21
	Jno. Fricker	Services, etc	15.00
	Sam Sloan	Repairing flagstaff	20.00
	Fred M. Locke	Insulators, etc	7.60
	F. L. Hartenstein	Repairing clock	2.00
	American Electrical Works	Copper wire	15.84
	do	do	9.44
	Jno. A. Roeblings Son's Co	Iron wire	6.98
	F. F. Bossnot	Cleaning instrument stand	1.00
	Jules Richard	Tele-thermometers	424.21
	Dickerson Bros	Services and material	50.00
	O. J. Maigne	Recasting rollers	38.36
11	Morris Joyce Engraving Co	Electrotype plates	35.18
	Geo. F. Muth & Co	Turpentine	26.52
	Jno. C. Parker	Map paper	373.70
	do	Tag board, etc	16.90
	Thos. Somerville & Sons	Pipe, solder, etc	10.36
	J. Baumgarten & Sons	Logotypes	1.50
	J. Edw. Turton	Swinging frames, etc	115.50
	Norfolk and Washington Steamboat Co	Transportation	3.39
12	Pay roll, New York, N. Y	Substations, salary	35.00
	I. M. Cline	Traveling expenses	9.25
	R. A. Fessenden	do	6.50
	J. C. Piercy	Office expenses	1.40
	Enoch B. Stevens	do	1.60
	People's Telephone Co	Service	5.00
	Alabama, Mississippi and Tennessee Telephone Co.	do	6.50
	Alabama and Georgia Long Distance Telephone Co.	do	15.60
	Ocean Tow Boat Line	do	14.00
	do	do	10.00
	South Florida Telegraph Co	do	3.40
	do	do	6.80
	Postal Telegraph Cable Co. of Texas	do	55.47
	J. T. Harper	do	14.12
	Minneapolis, St. Paul, and Sault Ste. Marie Rwy. Co.	do	10.60
	Great Northwestern Telegraph Co. of Canada.	do	221.00
	do	do	88.42
	Philadelphia, Reading and Pottsville Telegraph Co.	do	10.78
	Ohio River Telegraph Line	do	5.20
	Jacksonville and St. Johns Bar Telegraph Line.	do	7.75
	Corvallis and Eastern R. R. Co	do	2.60
	Rising Sun Telegraph Line	do	2.60
	L. F. Sickenberger	Services	21.00
	Hoke Engraving Plate Co	Recoating plates	75.00
	do	do	75.00
	do	do	62.50

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

WEATHER BUREAU—GENERAL EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
June 12	Fred Albright	Use horse	$1.00
	Allie Mawhirter	do	1.00
	Oscar W. Bye	do	1.00
	A. McDonald	Services	12.00
	J. H. Thiessen	Packing boxes	48.75
	Barnhart Bros. & Spindler	Galleys	4.50
	Leon Risley	Repairs to wind vane	5.00
	J. E. Denton	Use team	3.00
	Carey Machinery and Supply Co	Supplies	19.97
	Jas. Brechemin	Reshading map	12.00
	H. W. McDermott	Services	2.00
	J. M. McKeough	Recasting rollers	3.25
	Robt. Tyler	Printing crop bulletin	10.00
	J. W. Holmes	Repairs to telegraph line	8.25
	Western Union Telegraph Co	do	4.00
15	Geo. B. Wurtz	Office expenses	4.00
18	Western Union Telegraph Co	Service	13,727.87
	The Maurice Joyce Engraving Co	Engraving	2.25
	do	Electrotype plates	28.13
	United Typewriter and Supplies Co	Supplies	1.30
	Jno. C. Parker	Paper	479.60
	W. S. Jenks	Thermograph cover	1.75
	J. C. Entwistle	Engraving	7.50
	H. C. Frankenfield	Traveling expenses	82.95
19	Hoke Engraving Plate Co	Recoating plates	25.00
	J. W. Holmes	Repairs to telegraph line	9.00
	A. L. Simmons	do	1.50
	The City and Suburban Telegraph Co	Service	2.35
	Eimer & Amend	Supplies	24.82
	W. H. Smith	Hire team	60.00
	Valley Paper Co	Paper for printing	130.00
	Clarke & Co	Mounting chart, etc	2.00
	Julien P. Friez	Iron castings	13.60
	Kathryn Burke	Repairing calligraph	1.00
	E. H. Moorehouse & Co	Painting	25.00
	Peter Gray	Lanterns	1,035.00
	The Seneca Falls Manufacturing Co	Supplies	30.43
	Bennett Printing House	Printing report	16.00
	Pacific Transportation Co	Hauling, etc	20.26
	Jas. Hunter	Drayage	1.50
	Arkansas River Packet Co	Passenger transportation	7.00
	Atchison, Topeka and Santa Fe Rwy. Co	do	15.80
	Norfolk and Western Rwy. Co	do	16.50
	Burlington and Missouri River R. R. in Nebr.	do	27.15
	The Wabash R. R. Co	do	27.75
	Fremont, Elkhorn and Missouri Valley R. R. Co.	do	17.19
	Minneapolis, St. Paul and Sault Ste. Marie Rwy. Co	do	4.45
	Pennsylvania R. R. Co	do	37.23
	H. C. Bate	Office expenses	13.22
	do	do	7.50
	J. W. Smith	do	44.75
	Geo. Hass Hagen	do	.80
	Alfred H. Thiessen	Traveling	9.50
	O. L. Fassig	do	14.85
	R. A. Fessenden	do	31.90
	Wisconsin Telephone Co	Service	5.00
	The Central District and Printing Telegraph Co.	do	6.00
	Pacific States Telephone and Telegraph Co	do	2.60
	H. E. Wadsworth	do	74.67
	Isle of Wight Telephone and Telegraph Co	do	5.00
	Western Union Telegraph Co	Repairing telegraph line	4.93
	Simon W. Everett	Office rent	8.00
	Daisy D. Jacobs	Services	1.50
	American Type Founders Co	Rules	.90
	do	Type signs	3.30
	Barnhart Bros. & Spindler	Rollers	1.80
	do	Repairing ink disk	.60
	Chicago, Burlington and Quincy R. R. Co	Transportation	1.59
	Richmond, Fredericksburg and Potomac R. R. Co.	do	.60
	Hannibal and St. Joseph R. R. Co	do	1.09
	do	do	1.31
	do	do	.86
	Michigan Central R. R. Co	do	1.72
	Delaware and Hudson Co	do	.90
	Columbia Southern Rwy. Co	do	.89

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

WEATHER BUREAU—GENERAL EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
June 19	Star Union Line	Transportation	$2.59
	do	do	.89
	Atchison Topeka and Santa Fe R. R. Co	do	6.32
	Pennsylvania R. R. Co	do	.35
	do	do	.35
	do	do	.42
	do	do	.35
	do	do	.67
	do	do	.37
	do	do	.70
	do	do	.44
	do	do	.58
	do	do	2.08
	do	do	.66
	do	do	.25
	Gulf, Western Texas and Pacific Rwy. Co	do	.45
	Lake Shore and Michigan Southern Rwy. Co.	do	.37
	Pere Marquette R. R. Co	do	3.13
	do	do	2.26
	do	do	.62
	Louisville and Nashville R. R. Co	do	2.33
	The Oregon Short Line R. R. Co	do	31.95
	do	do	22.91
	New York, New Haven and Hartford R. R. Co	do	1.70
	Maricopa, Phoenix and Salt River Valley R. R. Co.	do	2.16
	New Bedford, Marthas Vineyard and Nantucket Steamboat Co.	do	.91
	Harry E. Overstreet	do	.36
	Chesapeake and Ohio Rwy. Co	do	2.12
	do	do	1.82
	do	do	.44
	Annapolis, Washington and Baltimore R. R. Co.	do	.25
20	Postal Telegraph-Cable Co	Service	245.26
	do	do	34.16
	Saml. C. Long	Traveling expenses	12.20
	W. F. R. Phillips	do	16.00
	Jas. H. Kimball	do	8.50
	H. W. Grasse	Office expenses	6.25
	Western Union Telegraph Co	Labor and material	170.45
	Barnhart Bros. & Spindler	Type	5.82
	American Type Founders Co	Brass rules	.90
29	Alpheus Drinkwater	Office expenses	.80
	R. B. Harkness	do	2.00
	L. G. Schultz	do	2.40
	A. H. Thiessen	do	29.85
	F. W. Brist	Traveling expenses	30.00
	Corvallis and Eastern R. R. Co	Service	2.60
	Rising Sun Telegraph Line	do	2.60
	Chicago, Burlington and Quincy R. R. Co	do	2.66
	Western Union Telegrph Co	do	147.35
	International Ocean Telegraph Co	do	227.63
	Wisconsin Telephone Co	do	5.40
	Ohio River Telephone Line	do	5.00
	Alabama, Mississippi and Tennessee Telephone Co.	do	6.50
	Aurora and Friendship Telephone Line	do	7.80
	Hoke Engraving Plate Co	Recoating plates	27.25
	Sanderson Bros. Steel Co	Supplies	39.48
	A. C. Perry	Services	2.50
	Towner Hardware Co	Hoisting rope	2.36
	J. A. Logan	Repairing wind vane	6.00
	Barnhart Bros. & Spindler	Brass rule	4.20
	W. H. Smith	Varnish	5.00
	Alex. H. Revell & Co	Repairing chair	4.00
	United States Envelope Co	Envelopes	8.70
	Osborn Cochrane	Reefing halyards	4.00
	Evans & Meekins	Barb wire, varnish, etc	45.55
	The Billings & Spencer Co	Dies and taps	7.52
	Meteorological Council	Compilation of telegrams	3.65
	W. F. R. Phillips et al	Salaries	272.00
	B. F. Lacombe et al	do	2,567.70
	Total fourth quarter		79.797.16

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

WEATHER BUREAU—GENERAL EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
	Supplemental.		
1901.			
July 2	The New York Maritime Register	Copy Maritime Register	$35.00
	S. A. Potter	Use ground, Arlington, Va	30.00
	T. C. Golden	Floor	1.95
	H. C. Beeson	Marine directories	50.00
	Allie Mawhirter	Use horse	2.00
	Brownell & McPhee	Ink	1.00
	Grand Trunk Rwy. System	Passenger transportation	2.84
	The State Journal Co	Printing bulletins	31.20
	Indianapolis Light and Power Co	Electric power	18.00
	Henry T. Legler	Electric light	3.50
	E. A. Born	Electric current	6.00
	P. C. Shaw	Towel supply	6.00
	Norfolk Steam Laundry Co	do	3.00
	M. J. Greer	do	1.50
	Amelia McLean	do	3.00
	C. W. Byrnes	do	3.00
	The Inland Telephone and Telegraph Co	Rent	9.00
	D. P. Fisher	Painting	6.00
	Jno. McCallum	Moving storm-warning towers	35.00
	Joe Coley	Repairing telegraph line	7.50
	Jno. Lang	do	2.50
	F. E. Norton	Erecting lantern shelter, etc	10.00
	Cavalier Bros	Erecting support	75.00
	S. Spiro	Repairing rain gauge	.50
	Isaac M. Small	Services	5.35
	E. W. Buckingham	Repairing clock	2.50
	Ora Burgess	Cleaning office	3.00
	C. J. Oyler	Washing towels, etc	4.50
	Frank Ridgway	Office expenses	3.95
	S. S. Bassler	do	2.00
	David Cuthbertson	do	4.74
	Jno. R. Weeks	do	.50
	Saml. L. Mosby	Traveling expenses	3.25
	do	do	7.60
	Solomon Hyman	do	1.70
	Jno. Gover	do	44.65
	B. S. Pagne	do	7.50
	Alex. G. McAdie	do	4.00
	Balfe D. Johnson	Office rent	63.00
	City of Columbia, S. C	do	90.00
	Meggie French	do	59.20
	Ulysses G. Myers	do	175.00
	Mary C. Pratt et al	do	93.75
	The Farmers' National Bank of Fresno	do	115.00
	Indianapolis Gas Co	do	250.00
	R. McLaughlin	do	150.00
	The Conrad National Bank	do	67.50
	Dent & Butler	do	105.00
	Albert W. Kennie	do	42.00
	Citizens' Bank of Norfolk, Va	do	131.25
	Walla Walla Lodge, No. 56, I. O. O. F	do	84.87
	A. C. Rackliff	do	75.00
	E. H. Jamison	do	135.00
	A. J. Knight	do	82.19
	E. P. Jones	do	25.00
	E. J. Davenport	do	100.00
	Edgar Harding	do	87.50
	Ella W. Daniels	do	87.50
	Prudential Building Co	do	134.96
	Peter Sonna	do	120.00
	F. E. Warren Mercantile Co	do	129.40
	H. Wallenberg, administrator	do	77.25
	Chas. P. Meekins	do	10.00
3	Charlevoix Electric Light Plant	Electric light	4.50
	Tampa Electric Co	do	5.00
	do	do	2.75
	Eliz. L. Renoe	Office expenses	3.25
	F. L. McClintic	do	1.80
	Simon Nusbaum, postmaster	Rent of post-office box	1.50
	Chicago Auditorium Association	Office rent	450.00
	Ed. Ketchum	Hauling	3.25
	Wm. McLaughlin	do	1.35
	C. A. Blummer	Services	15.00
	Georgetown Iron Works	Repairing vane	5.00
	Grant Rivenburg	Ice	3.19
	The Southwestern Telegraph and Telephone Co.	Rent	9.00
	Citizens' Telephone Co	do	6.00
	Cumberland Telephone and Telegraph Co	do	10.00

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

WEATHER BUREAU—GENERAL EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
	Supplemental—Continued.		
1901.			
July 3	Santa Fe Electric Telephone Co	Rent	$6.00
	Capital Telephone and Telegraph Co	do	4.50
	The Southern New England Telephone Co.	do	27.00
	Dodge City Telephone Co	do	3.00
	Southern Bell Telephone and Telegraph Co.	do	12.00
	Southwestern Telegraph and Telephone Co.	do	15.00
	The Northwestern Telephone Exchange	do	9.00
	Southern Bell Telephone and Telegraph Co	do	10.00
	Southern States Telephone Co	do	9.50
	Southern Bell Telephone and Telegraph Co	do	7.50
	Nebraska Telephone Co	do	12.00
	Wisconsin Telephone Co	do	3.75
	La Crosse Telephone Co	do	7.50
	Pennsylvania Telephone Co	do	20.00
	Sunset Telephone and Telegraph Co	do	6.00
	The Telephone Co. of South Jersey	do	5.00
	New York and Pennsylvania Telephone and Telegraph Co	do	21.00
	Central Union Telephone Co	Services	10.50
	Missouri and Kansas Telephone Co	do	9.00
	Rocky Mountain Bell Telephone Co	do	8.25
	The Empire State Telephone and Telegraph Co	do	15.00
	Ontario Telephone Co	do	7.50
	Southern Bell Telephone and Telegraph Co	do	3.00
	Lynchburg Telephone Co	do	3.00
	The Pacific States Telephone and Telegraph Co	do	9.00
	The Bell Telephone Co. of Buffalo	do	21.50
5	Henry J. Green	Thermometers	140.00
	Hoke Engraving Plate Co	Recoating plates	50.00
	Ray Munroe	Services	10.50
	P. Murray	Cleaning carpets, etc	3.50
	The R. L. Bryan Co	Printing bulletins	48.00
	Talbott & Hamann	do	21.72
	E. D. Beattie	do	36.00
	Horace G. Whitney	do	27.50
	Robt. Tyler	do	10.00
	W. W. McCollough	Constructing river gauge	82.00
	Lincoln Traction Co	Electric current	13.50
	San Antonio Gas and Electric Co	do	6.25
	Fort Wayne Electric Works	Brush holders, etc	5.00
	American Linen Supply Co	Towel service	3.00
	Kentucky Laundry Co	do	1.50
	E. M. Bowman	Drayage	1.00
	O. I. Mairs	do	.50
	T. B. Satterwhite & Co	Ice	1.30
	E. S. Hughs & Co	Office rent	106.11
	Pacific Club	do	67.50
	Orson Adams, jr	do	120.00
	S. B. Hicks	do	120.00
	Utah and Pacific R. R. Co	do	45.00
	G. E. Shaw	do	70.00
	T. M. Jeffris & Co	do	100.00
	Union Trust Building Co	do	167.50
	H. F. Barnett	do	10.00
	T. B. Catron	do	105.00
	O. I. Mairs	do	67.50
	The Gamble Desmond Co	do	100.00
	Otto B. Hart	do	24.00
	Eliz. L. Renoe	do	100.00
	C. M. Beeson	do	88.91
	Tyree & Wilkins, agents	do	67.50
	Geo. L. Lovett	do	105.00
	Wm. Pollman	do	87.50
	The Marquette County Savings Bank	do	90.00
	American Surety Co. of New York	do	625.00
	H. Overholzer	do	127.50
	D. Horton	do	120.00
	Estate of Isaac Eberly	do	154.00
	Warfield & Dann	do	75.00
	East Tennessee Telephone Co	Rent	9.00
	do	do	9.00
	The Woodford Telephone Co	do	5.00
	Central Union Telephone Co	do	40.50
	Chicago Telephone Co	do	57.50
	Rocky Mountain Bell Telephone Co	do	10.50

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

WEATHER BUREAU—GENERAL EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
	Supplemental—Continued.		
1901.			
July 5	Cumberland Telephone and Telegraph Co.	Rent and service	$16.50
	San Antonio Telephone Co	do	10.50
	Southern Bell Telephone and Telegraph Co.	do	10.00
	Delaware, Lackawanna, and Western R. R. Co.	Passenger transportation	7.75
	Pittsburg and Cincinnati Packet Line	do	7.00
	Missouri Pacific Rwy. Co	do	7.50
	Katherine Ryan	Services	12.00
	J. W. Branan	do	15.00
6	Fredk. Springmann	Transportation	6.75
	United States Express Co	do	14.57
	Geo. F. Muth & Co	Supplies	27.49
	J. Baumgarten & Sons	Rubber stamps	24.47
7	Pay roll, New Haven, Conn	Substation, salaries	32.84
	Pay roll, Chicago, Ill	do	364.00
	Pay roll, Shreveport, La	do	42.00
	Pay roll, Harrisburg, Pa	do	42.00
	Pay roll, Norfolk, Va	do	105.00
	Baltimore and Ohio R. R. Co	Passenger transportation	10.25
	G. Luchtenberg	Repairing clock	3.00
	People's Telephone and Telegraph Co	Rent	7.50
	Times Journal Publishing Co	Printing bulletin	18.00
	Evans & Meekins	Gasoline	1.50
	Bernstein & Co	Repairing register case	1.75
	J. C. Worthington	Services	3.50
	T. J. Derby	Erecting instrument shelters	11.00
9	Jos. Urlacher	Transportation	1.00
	Burlington and Missouri River R. R. in Nebraska.	do	14.50
	Chicago, Rock Island and Texas Rwy. Co	do	1.25
	Cleveland, Cincinnati, Chicago and St. Louis Rwy. Co.	do	6.43
	New York, New Haven and Hartford R. R. Co.	do	10.38
	Union Pacific R. R. Co	do	2.38
	Wabash R. R. Co	do	3.25
	The Cleveland, Lorain and Wheeling Rwy. Co.	do	.49
	Annapolis, Washington and Baltimore R. R. Co.	do	10.79
	Deckerville, Osceola and Northern R. R. Co.	do	1.21
	Louisville and Nashville R. R. Co	do	2.41
11	N. W. Wagner	Services	21.00
	Jno. T. Myers	do	15.00
	Jas. Evans	do	9.00
	Bank and Insurance Building Co	Office rent	100.00
	Frank D. Miracle	do	105.00
	Pay roll, Buffalo, N. Y	Substation, salaries	127.80
	Pay roll, Chicago, Ill	do	385.00
	Pay roll, Parkersburg, W. Va	do	135.67
	Pay roll, Atlanta, Ga	do	72.00
	do	do	135.20
	Pay roll, Memphis, Tenn	do	182.40
	Baltimore Towel Supply Co	Washing towels	2.25
	Thos. Barry	do	6.00
	Chas. G. Le Clair	Ice	1.00
	American Ice Co	do	2.00
	Hoke Engaving Plate Co	Stereotype metal	10.60
	Faneuil Watch Tool Co	Supplies for repairing instruments.	232.20
	Val Blatz Sons	Benzine	2.25
	Arizona Publishing Co	Printing bulletins	90.50
	C. B. Little	Water	11.00
	Board of Public Works	do	3.50
	Lehigh Valley R. R. Co	Transportation	6.08
	E. H. Furbush	Drayage	.50
	McCormick & Bates	do	.75
	Hoke Engraving Plate Co	Recoating plates	62.50
	Cumberland Telephone and Telegraph Co.	Rent	21.00
	O. D. Steward	Office expenses	3.15
	J. W. Smith	Traveling expenses	9.65
	Jas. J. Gray	Office expenses	7.71
	J. W. Bauer	do	.60
	W. S. Currier	do	1.75
	Allen Buell	do	2.90
	E. H. Nimmo	do	.50
	Geo. T. Todd	do	4.25

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

WEATHER BUREAU—GENERAL EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
	Supplemental—Continued.		
1901.			
July 11	H. B. Hersey	Office expenses	$10.92
	W. M. Fulton	do	11.25
	Albert Ashenberger	do	.25
	G. N. Wilson	do	2.65
	Wm. M. Neifert	Traveling	4.00
	R. A. Fessenden	Office expenses	4.50
12	Real Estate and Law Building Co	Office rent	43.75
	Lorenzo Littlefield	do	64.99
	Ray G. Lewis	do	5.00
	Henry Bolton	do	52.84
	Albert Marty	do	165.00
	J. L. Manning	do	58.94
	Jos. Gussenhoven	do	90.00
	Jno. Semer	do	114.00
	H. W. Styron	do	38.63
	City of Palestine, Tex	do	78.50
	Jno. G. Brown	do	75.00
	C. S. McLaury et al	do	69.00
	Bank of Tehama County	do	99.06
	Fannie L. Keating	do	90.00
	Edw. W. Osborn	do	87.50
	Geo. S. Waite	do	119.82
	Portland Trust Co. of Oregon	do	210.00
	Margaret Parmentier	do	75.00
	Luke & Smith	do	75.00
	Mount Washington Rwy. Co	do	5.00
	W. D. Grant	do	225.00
	Amarillo Improvement Co	do	30.00
	B. S. Williams	do	73.00
	Northwestern Mutual Life Insurance Co	do	124.00
	Paine Bros	do	73.95
	C. L. Graves	Drayage	.75
	O. J. Glenn	do	4.35
	Samuels Transfer and Storage Co	do	1.50
	Buffalo Gas Co	Gas	7.90
	Southern Bell Telephone and Telegraph Co.	Rent	13.50
	The Chesapeake and Potomac Telephone Co.	do	31.25
	The Union Telephone Co	do	5.00
	Alpena Electric Light Co	Electric light	5.00
	United Electric Light and Power Co	do	3.00
	Transylvania Co	Repairs to caligraph	2.00
	Robertson & Weitzell	Benzine	.50
	J. I. Lengsfield	Printing bulletins	38.40
	W. H. H. Smith	Use horse and wagon	11.00
	Ed. E. Hayes	do	1.90
	M. A. Graham	Washing towels	1.50
18	Michael O'Leary	Sand	1.50
	The Chesapeake and Potomac Telephone Co.	Service	35.80
	Jas. B. Lambie	Leather belting	13.94
	Geo. F. Muth & Co	Tape line	9.25
	do	Pen	1.35
	Postal Telegraph-Cable Co	Service	29.21
	H. B. Boyer	Office expenses	.40
	P. H. Smith	do	.50
	J. B. Marbury	do	5.35
	A. C. Burrows	do	.75
	Geo. E. Franklin	do	2.80
	Pay roll, Portland, Me	Substation salaries	75.00
	Pay roll, Des Moines, Iowa	do	230.80
	Pay roll, Baltimore, Md	do	45.00
	Pay roll, Alpena, Mich	do	85.00
	Pay roll, New York, N. Y	do	35.00
	Pay roll, Pensacola, Fla	do	36.00
	M. E. Conway	Office rent	37.74
	H. H. Taylor, agent	do	322.50
	Jas. L. Connell	do	118.75
	The First National Bank, Portland, Me	do	126.00
	Jno. E. Dooly	do	150.00
	Catherine Wilson	do	140.82
	Adam Geiger	do	60.00
	H. S. Gilbert, county treasurer	do	67.00
	Simon W. Everett	do	8.00
	Jas. K. Porter	do	150.00
	L. Rogers	Services	15.00
	Carrie M. Frahm	do	12.50
	Robt. Maxwell	do	25.00
	J. W. Tait	do	25.00

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

WEATHER BUREAU—GENERAL EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
	Supplemental—Continued.		
1901.			
July 18	A. R. Weir	Services	$25.00
	N. P. Arnold	do	37.50
	E. J. Plough	do	7.74
	Starling Swigert	do	21.00
	M. M. Laidley	do	21.00
	Western Union Telegraph Co.	Service	1.05
	New England Telephone and Telegraph Co.	do	2.55
	International Ocean Telegraph Co	do	212.90
	do	do	145.19
	Minneapolis, St. Paul and Sault Ste. Marie Rwy. Co.	do	12.27
	Great Northwestern Telegraph Co	do	138.99
	Postal Telegraph and Cable Co. of Texas	do	59.77
	Jacksonville and St. Johns Bar Telegraph Line.	do	4.00
	Philadelphia, Reading and Pottsville Telegraph Co.	do	10.71
	Isle of Wight Telephone and Telegraph Co.	do	5.20
	The Central District and Printing Telegraph Co.	do	6.20
	Pacific States Telephone and Telegraph Co.	do	2.50
	Alabama and Georgia Long Distance Telephone Co.	do	14.50
	Aurora and Friendship Telephone Line	do	7.80
	Georgia Telephone and Telegraph Co	do	10.00
	Hudson River Telephone Co	do	16.50
	Delaware and Atlantic Telegraph and Telephone Co.	do	12.00
	Southern Bell Telephone and Telegraph Co.	do	15.00
	Thos. H. Smith	Cleaning motor	2.50
	Cumberland Electric Light and Power Co.	Electric current	15.00
	Grand Haven City Electric Light Co	do	3.75
	O. C. G. Urban	do	2.00
	People's Gaslight and Coke Co	Gas	8.40
	Mary Fantleroy	Towel service	1.50
	The American Toilet Supply Co	do	2.25
	J. F. Beck	do	3.00
	Meteorological Council	Compilation of telegrams	3.77
	Bennett Printing House	Printing report	16.00
	Indiana Printing and Manufacturing Co	Paper	4.75
	H. A. Brossard	Drayage	3.75
	F. L. Johnson	Office expenses	2.00
	Wm. G. Burns	do	5.10
	F. H. Clarke	do	4.75
	Geo. A. Loveland	do	6.60
	H. B. Dick	do	5.25
	W. H. Fallon	do	.50
	Robt. L. Anderson	do	1.00
	M. J. Wright, jr	do	.50
	W. S. Belden	do	8.10
	L. H. Murdock	do	2.75
	Chas. M. Strong	do	1.00
	Marcos Sanchez	Services	15.00
	E. J. Kelliher	do	15.00
	J. W. Holmes	Repairing telegraph line	6.00
	Thos. W. Pemberton	Electric light	5.10
	McEwen & Lanver	Wood	1.92
	F. T. Whittemore	Repairing clock	1.50
	Chase Paint and Oil Co	Benzine	1.50
	H. L. Pittock	Electric current	18.00
	The Portland Gas Co	Gas	10.50
	Holmes Coal and Ice Co	Ice	1.20
	J. W. Holmes	do	2.80
	P. Minor	do	9.95
	Columbia Telephone Co	Rent	10.50
	The Colorado Telephone Co	do	22.50
	Pacific States Telephone and Telegraph Co.	do	22.50
	do	do	7.50
	Southern Bell Telephone and Telegraph Co.	do	20.00
	The City and Suburban Telegraph Assn	Service	21.00
	Cumberland Telephone and Telegraph Co.	Rent	29.85
	Missouri and Kansas Telephone Co	Service	30.00
	Cumberland Telephone and Telegraph Co.	Rent	12.00
	East Tennessee Telephone Co	Service	10.50
	The Colorado Telephone Co	Rent	13.50
	The Central District and Printing Telegraph Co.	do	34.25

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

WEATHER BUREAU—GENERAL EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
	Supplemental—Continued.		
1901.			
July 18	Missouri and Kansas Telephone Co	Rent	$6.00
	do	do	18.00
	Iowa Telephone Co	do	30.00
	Uriah P. Dodge	Use team	1.00
	L. Rodgers	Use horse and cart	30.00
	Summers Printing Co	Printing report	42.00
	L. Naegele & Sons	do	21.00
	Banner Laundering Co	Towel service	6.00
	Laura Warimer	do	3.00
	The Silver State Towel Supply Co	do	2.25
20	C. P. Disney	Services	21.00
	L. W. Glenn	Office expenses	2.92
	Hal P. Hardin	do	2.75
	T. S. Outram	do	2.85
	Jas. J. Gray	do	1.50
	P. McDonough	do	.50
	E. H. Emery	do	19.28
	F. A. Carpenter	do	8.30
	R. M. Hardinge	do	2.35
	U. G. Purssell	do	.25
	M. E. Blystone	do	1.20
	J. S. Hazen	do	.50
	Aaron H. Bell	do	2.00
	N. D. Lane	do	1.80
	J. M. Sherier	do	1.75
	Geo. Reeder	do	.70
	A. E. Hackett	do	6.85
	L. M. Pindell	do	1.00
	L. N. Jesunofsky	do	2.00
	J. P. Bolton	do	2.50
	R. A. Fessenden	Traveling expenses	26.75
	Jas. J. Widmeyer	do	13.75
	M. W. Hayes	do	9.25
	Fredk. W. Brist	do	12.85
	W. T. Blythe	do	4.10
	Pay roll, Savannah, Ga	Substation, salaries	61.00
22	W. M. Wilson	Office expenses	5.90
	Thos. A. Boon	Services	30.00
	W. T. Turbeville	do	15.00
	Josie G. Smith	do	21.00
	B. F. Modisett	do	30.00
	Una V. Hendrix	do	21.00
	Estate of Ellen C. Thompson	do	15.16
	Pay roll, Montgomery, Ala	Substation, salaries	67.00
	Pay roll, La Crosse, Wis	do	63.00
	Pay roll, Sault Ste. Marie, Mich	do	74.66
	Pay roll, Wilmington, N. C	do	72.00
	Pay roll, Philadelphia, Pa	do	69.00
	Pay roll, Milwaukee, Wis	do	145.00
	Pay roll, New Orleans, La	do	67.50
	Wisconsin Telephone Co	Service	18.00
23	Northwestern Telephone Exchange Co	do	18.00
	Cumberland Telephone and Telegraph Co	Rent	30.00
	Black Hills Telegraph and Telephone Co	do	21.00
	Pacific States Telegraph and Telephone Co	do	18.00
	Southern Bell Telephone and Telegraph Co	Service	4.50
	do	do	8.25
	Interstate Telephone and Telegraph Co	do	4.50
	Rocky Mountain Bell Telephone Co	do	9.00
	Iowa Telephone Co	do	13.50
	Columbia Telephone Co	Rent	6.00
	Meridian Telephone Co	do	6.00
	R. L. Lewis	do	20.25
	Geo. W. Finch	do	6.00
	New England Telephone and Telegraph Co	do	9.00
	A. Hamacek	Electric current	5.00
	Menominee Electric Light, Railway, and Power Co.	do	3.50
	Geo. A. Orr	do	4.00
	Board of Fire and Water Commissioners	do	5.00
	Washburn Electric Light and Power Co	do	4.00
	Ashland Light, Power, and Street Rwy. Co	do	5.00
	Edison Sault Electric Co	do	10.62
	Minnesota International Electric Co	do	15.00
	Georgetown Electric Co	do	6.75
	W. L. Howes	Drayage	1.50
	Chas. D. Page	do	4.75
	M. T. Hayden	Washing towels	3.00
	Nashville Laundry Co	do	1.80

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

WEATHER BUREAU—GENERAL EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
	Supplemental—Continued.		
1901.			
July 23	Geo. M. Hubinger	Washing towels	$3.00
	Theodore Schallere	Painting	9.00
	Robt. Aldenbrook	do	5.00
	J. H. Ledoux	Water	6.42
	Consolidated Gas Co	Gas	.55
	The Maine Record Publishing Co	Marine Record	38.00
	John Longstaff	Printing bulletins	27.50
	H. B. Todd	Traveling expenses	8.60
	L. M. Tarr	Office expenses	10.00
	E. A. Beals	do	1.00
	S. Hackett	do	.50
	Albert Brand	do	30.84
	E. C. Vose	do	4.15
	W. S. Palmer	do	1.16
	Pay roll, Boston, Mass	Substation, salaries	758.25
24	Pay roll, Little Rock, Ark	do	167.00
	Pay roll, Montgomery, Ala	do	106.40
	Pay roll, Mobile, Ala	do	72.00
	Pay roll, New Orleans, La	do	181.40
	do	do	84.00
	Pay roll, Augusta, Ga	do	136.80
	do	do	34.50
	Pay roll, Raleigh, N. C	do	111.00
	Pay roll, Wilmington, N. C	do	106.40
	Pay roll, Charleston, S. C	do	60.80
	do	do	88.00
	Pay roll, Nashville, Tenn	do	70.50
	Pay roll, Chattanooga, Tenn	do	151.80
	Pay roll, Cairo, Ill	do	139.10
	Pay roll, Pittsburg, Pa	do	324.25
	Pay roll, Duluth, Minn	do	106.65
	Pay roll, Cleveland, Ohio	do	141.99
	Pay roll, Columbus, Ohio	do	235.80
Aug. 3	Pay roll, Omaha, Nebr	do	45.10
	do	do	230.60
	Pay roll, Minneapolis, Minn	do	343.00
	Pay roll, Houghton, Mich	do	42.66
	Pay roll, Escanaba, Mich	do	37.50
	Pay roll, Cincinnati, Ohio	do	192.50
	Pay roll, Indianapolis, Ind	do	181.80
	Pay roll, La Crosse, Wis	do	4.50
	Pay roll, Savannah, Ga	do	166.60
	Pay roll, Vicksburg, Miss	do	78.00
	do	do	60.80
	Pay roll, New Orleans, La	do	105.80
	Pay roll, Kansas City, Mo	do	294.60
	Pay roll, St. Louis, Mo	do	146.60
	Pay roll, Fort Smith, Ark	do	39.00
	Pay roll, Little Rock, Ark	do	9.00
	do	do	42.00
	Pay roll, Louisville, Ky	do	271.80
	Mattie D. McKee	Services	9.60
	Ed. J. Kendall	do	25.00
6	Postal Telegraph Cable Co	Service	270.99
	Geo. C. Maynard	do	102.04
	J. H. Robinson	Traveling expenses	15.50
	M. G. Copeland & Co	Flag	57.20
	do	do	33.60
	J. Baumgarten & Sons	Rubber stamps	2.61
	Fred. A. Schmidt	Maps	364.00
	do	do	24.00
7	E. A. Hughes	Electric light	9.00
	City of East Tawas, Mich	Electric current	7.50
	Max Levy	do	30.00
	Norwich University	Electric current, etc	12.00
	Charleston Consolidated Railway, Gas, and Electric Co.	Electric current	3.00
	People's Gas and Electric Co	do	1.40
	Excelsior Electric Co	do	1.50
	Electric Lighting Co. of Mobile	do	1.50
	Standard Gas and Electric Co	Gas	10.20
	Nashville Gas Co	do	11.60
	Galveston Gas Co	do	23.10
	W. H. Renear	Use horse and wagon	2.00
	Dan. W. King	Washing towels	3.75
	Omaha Towel Co	do	3.00
	Dora Moyen	Washing flags	6.00
	N. B. Wood	Washing towels	3.00
	Doster & McCurdy	Ice	16.50

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

WEATHER BUREAU—GENERAL EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
	Supplemental—Continued.		
1901. Aug. 7	Chas. H. Rowland	Ice	$1.50
	R. B. Smith	Cleaning river gauge	10.00
	Tuttle Paint and Glass Co	Service, etc	8.50
	Blackmore & Beutle	Gasoline, etc	4.70
	Pacific States Telephone and Telegraph Co.	Rent	25.50
	New York and Pennsylvania Telephone and Telegraph Co.	do	6.75
	New York Telephone Co	do	60.00
	The Northwestern Telephone Exchange Co.	Service	18.00
	The Cleveland Telephone Co	do	18.00
	Mutual Telephone Co	do	22.50
	Michigan Telephone Co	Rent	6.00
	do	do	6.00
	do	do	2.50
	do	do	6.00
	do	do	38.25
	do	do	16.25
	The Bell Telephone Co. of Missouri	do	32.00
	The Bell Telephone Co. of Buffalo	do	12.00
	Southwestern Telephone and Telegraph Co.	Rent and service	7.50
	Southern Bell Telephone and Telegraph Co.	Rent	7.50
	do	do	7.50
	do	do	6.00
	Sunset Telephone and Telegraph Co	do	15.00
	do	do	.80
	G. R. Oberholzer	Office expenses	37.87
	B. S. Pagne	do	4.75
	C. F. R. Wappenhaus	do	.25
	R. H. Dean	do	.55
	W. M. Dudley	do	5.55
	W. T. Blythe	do	.50
	Geo. W. Felger	do	4.25
	W. S. Palmer	do	8.55
	E. A. Evans	do	7.70
	Geo. M. Salisbury	Traveling expenses	48.85
	R. A. Fessenden	Substation, salaries	181.40
	Pay roll, St. Louis, Mo	do	301.00
	Pay roll, Galveston, Tex	do	30.00
	do	do	27.25
	do	do	75.00
	Pay roll, Portland, Oreg	do	123.00
	do	do	3.00
	Paul O. Lauve	Services	15.20
	H. A. Morgan	do	12,096.27
8	Western Union Telegraph Co	Service	13,229.97
	do	do	5.00
	do	do	6.00
12	People's Telephone Co	do	15.00
	Almo Telephone Co	do	6.00
	Barron Co. Telephone Co	Services	7.80
	W. H. Holmes	Service	2.20
	Iowa Telephone Co	do	6.10
	Wisconsin Telephone Co	do	13.99
	Michigan Telephone Co	do	37.50
	Rocky Mountain Bell Telephone Co	do	14.80
	Staunton Mutual Telephone Co	do	25.80
	Alabama and Georgia Long Distance Telephone Co.	do	29.50
	East Tennessee Telephone Co	do	125.80
	Cumberland Telephone and Telegraph Co.	do	5.00
	do	do	11.73
	Ohio River Telephone Co	do	2.40
	The Central District and Printing Telegraph Co.	do	5.40
	do	do	154.23
	do	do	2.50
	Western Union Telegraph Co	do	1.10
	Rising Sun Telegraph Line	do	6.25
	East Louisiana R. R. Co	do	2.50
	Alabama, Mississippi and Tennessee Telephone Co.	do	5.00
	Corvallis and Eastern R. R. Co	do	7.70
	Isle of Wight Telephone and Telegraph Co.	do	144.00
	Winton Telegraph Co	do	2.77
	Dakota Central Telegraph Line	do	16.52
	Chicago, Burlington and Quincy R. R. Co.	do	
	Minneapolis, St. Paul and Sault Ste. Marie Rwy. Co.	do	

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

WEATHER BUREAU—GENERAL EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
	Supplemental—Continued.		
1901.			
Aug. 14	Chamber of Commerce Building Co	Office rent	$93.21
	Mary E. Shelden	do	93.75
	Bunce & Iiams	do	90.00
	Mill Valley and Mount Tamalpais Scenic Rwy. Co.	do	105.00
	Kate F. Coke	do	60.00
	Tacoma Chamber of Commerce and Board of Trade.	do	60.00
	J. Bryan	do	150.00
	Society for Savings	do	285.00
	Benj. M. Jacobs	do	30.00
	Improvement Loan and Trust Co	do	150.00
	Jno. A. Ubsdell	do	10.00
	Alex. G. McAdie	Office expenses	4.20
	Edw. P. Jones	do	4.40
	Geo. M. Chappel	do	1.60
	O. L. Fassig	do	.55
	J. J. Kelliher	do	12.75
	Orin Parker	do	5.20
	Alex. G. Burns	do	1.35
	T. B. Jennings	do	3.35
	S. C. Emery	do	.80
	Henry R. Patrick	do	1.65
	C. F. Von Herrmann	do	4.20
	R. J. Hyatt	do	4.50
	R. G. Allen	do	7.90
	J. M. Cline	do	8.05
	Chas. Adie	do	1.85
	A. J. Mitchell	do	3.70
	Pay roll, Mobile, Ala	Substation, salaries	121.60
	Pay roll, Jacksonville, Fla	do	75.00
	W. A. Smith	Use of team	50.00
17	Pere Marquette R. R. Co	Passenger transportation	3.95
	Pennsylvania R. R. Co	do	18.20
	North Montana Telephone Co	Service	20.80
	Postal Telegraph Cable Co. of Texas	do	84.19
	Eastern Telephone Co	do	4.30
	Pacific States Telephone and Telegraph Co	do	2.50
	Thos. L. Dalton	Services	25.00
	The First National Bank of Moorhead	Office rent	66.31
19	Sunset Telephone and Telegraph Co	Rent	15.00
	New England Telephone and Telegraph Co	do	14.25
	Duluth Telephone Co	do	12.50
	F. G. Blaisdell	Service	7.50
	Nebraska Telephone Co	Rent	15.00
	Michigan Telephone Co	Service	4.50
	do	Rent	12.00
	Northwestern Telephone Exchange Co	do	9.00
	The Bell Telephone Co of Philadelphia	do	30.00
	Southern Telegraph and Telephone Co	Service	9.00
	Southern Bell Telephone and Telegraph Co	Rent	17.00
	Jas. Hunter	Drayage	.75
	Chicago Telephone Co	Delivering bulletins	5.48
	A. A. Bolles	Carting	5.00
	California Truck Co	Hauling	4.00
	L. Naegele & Sons	Printing bulletins	22.50
	Dunn & Lemmon	do	30.00
	Kansas Farmer Co	do	30.00
	The Pegott & French Co	do	27.50
	East Florida Printing Co	do	15.00
	E. A. Slack	do	27.50
	Jas. Grant	Hire of sailboat	3.50
	Consolidated Electric Light Co. of Maine	Electric current	10.00
	Peninsular Electric Light and Power Co	do	.89
	Raleigh Electric Co	do	4.70
	Marais Lumber Co	do	6.00
	The Fort Smith and Van Buren Light and Traction Co.	do	3.00
	P. H. Cheny & Sons	do	4.50
	American Electrical Works	Supplies	31.55
	do	do	7.59
	F. L. Ewing	Ice	9.90
	Jones & Powell	do	1.56
	Consumers' Ice Co	do	3.90
	Union Ice Co	do	18.10
	F. G. Blaisdell	Water	9.00
	Neal D. Winslow	Gasoline	1.50
	Western Union Telegraph Co	Repairs to telegraph lines	10.80
	Jno. W. Graham & Co	Ink	3.00

Expenditures of Department of Agriculture for year ending June 30, 1901—**Cont'd.**

WEATHER BUREAU—GENERAL EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
	Supplemental—Continued.		
1901.			
Aug. 19	A. Brooker & Co	Window shade	$4.90
	do	Oil, etc	3.87
	S. S. Stanley	Case pigeonholes	5.00
	Jas. A. Pinney	Ink, etc	8.50
	The Smith-Premier Typewriter Co	Repairing	1.85
	Crotty Bros	Ink	2.10
	The J. D. Pace Manufacturing Co., Ltd	Window screens	2.50
	R. H. Vorpahl	Casting rollers	2.55
	Gamble & Ludwig	Gasoline	.65
	F. H. Carr	Running levels	5.00
	American Hard Rubber Co	Hard-rubber rod	8.29
	L. H. Jones	Recasting rollers	2.70
	Jno. L. Boland Book and Stationery Co	Ink	1.85
	Jno. W. Stonebraker	Paper	97.12
	J. H. Thiemeyer	Packing boxes	15.00
	Max Levy	Oil, etc	1.45
	B. Ganter	Repairing clock	3.50
	Knapp Bros	Casting rollers	6.00
	Keens & Sharp	Wall paper	5.50
	New Orleans Lighting Co	Gas	18.56
22	United States Envelope Co	Envelopes	502.94
	A. Riemann & Co	Electric fan	14.00
	Hoke Engraving Plate Co	Pair handles	1.00
	W. W. Best	Repairing telegraph lines	2.00
	American Type Founders Co	Binders' pins, etc	1.40
	Hoke Engraving Plate Co	Recoating plates	62.50
	do	do	50.00
	Jas. B. Lambie	Supplies	77.21
	Washington Steamboat Co	Transportation	4.30
	The Garrett Printing Co	Printing bulletins	28.80
23	C. W. Curtsinger	Recoating rollers	3.00
	Peleg Brown	Use team	12.00
	Asa Church	Services	8.00
	A. B. Kennedy	Cleaning clocks	2.00
	W. A. Tate	Services	3.50
	D. M. Steen	Repairing rain gauges	1.50
	J. T. Laughlin	Repairing clock	1.50
	Havre Furniture Co	Carpet paper	2.20
	H. M. Knowles	Repairing telegraph lines	2.00
	Nettie Ford	Services	15.20
	Southwestern Telegraph and Telephone Co	Rent	9.00
	Statesmen Printing Co	Printing bulletins	101.50
	Pacific Transfer Co	Drayage	10.25
	Jas. N. Fulton	do	.50
	E. E. Garrett	Oil	1.50
	Jno. W. Eagleson	Ice	2.50
	J. T. Stearns	Electric current	5.00
	Fred Albright	Horse hire	1.00
	Alie Mawhirter	do	4.50
	Jas. R. Hobbs	Team hire	2.00
Sept. 6	Chas. L. Katzenberger	Services	18.20
	Chas. S. McElroy	do	10.26
	Pay roll, Richmond, Va	Substation salaries	24.50
9	Schneider Bros	Anemometer cups	25.00
	Union Typewriter and Supplies Co	Repairing typewriter	12.10
	E. B. Peddinghaus	Photograph	2.00
	The J. M. Carpenter Tap and Die Co	Plug tap	.25
	August Mietz	Lamp	5.00
	Cuprigraph Co	Sanitary still	12.00
	R. W. Morrison Construction Co	Erecting wind vane	2.50
	Inland Type Foundry	Printing material, etc	11.33
	E. A. Robertson	Cleaning clock	5.00
	Evans & Meekins	Supplies	4.11
	A. H. Thiessen	Office expenses	40.87
10	S. M. Blandford	do	.40
	P. F. Lyons	do	4.95
	Chas. Stewart	do	2.05
	E. B. Richards	do	3.75
	A. J. Mitchell	do	4.50
	J. H. Smith	do	1.25
	E. J. Fitch	do	3.50
	Eimer & Amend	Repairing doors, etc	21.45
20	Lake Shore and Michigan Southern Rwy. Co.	Supplies	2.75
		Passenger transportation	19.00
	Illinois Central R. R. Co	do	3.75
	The Yazoo and Mississippi Valley R. R. Co	do	6.25
	Jacksonville and St. Johns Bar Telegraph Line.	Service	1.65
	The Bell Telephone Co. of Buffalo	do	

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

WEATHER BUREAU—GENERAL EXPENSES—Continued.

Date.	Name.	Nature of payment.	Total.
	Supplemental—Continued.		
1901.			
Sept. 20	Aurora and Friendship Telegraph Line	Service	$7.50
	Ocean Tow Boat Line	do	2.00
	Philadelphia, Reading and Pottsville Telegraph Co.	do	10.07
	People's Telephone Co	do	5.00
	Edw. A. Beals	Office expenses	.25
	Chicago Edison Co	Electric light	.82
23	Baltimore and Ohio R. R. Co	Passenger transportation	15.20
	do	do	38.82
	Cumberland Valley R. R. Co	do	8.93
	Grand Trunk Rwy. System	do	2.84
	Pennsylvania R. R. Co	do	48.75
	Lake Shore and Michigan Southern Rwy. Co.	do	20.50
	Louisville and Nashville R. R. Co	do	3.50
	New York, New Haven and Hartford R. R. Co.	do	12.50
	do	do	19.50
	Chicago and North-Western Rwy. Co	do	4.45
	The Chesapeake and Ohio Rwy. Co	do	4.40
	Nashville, Chattanooga and St. Louis Rwy. Co.	do	20.40
	Michigan Telephone Co	Service	.50
	American Type Founders Co	Type	16.62
	Southern Rwy. Co	Passenger transportation	8.15
	do	do	2.30
27	Fredk. Springmann	do	1.55
	Southern Rwy. Co	do	11.75
Oct. 3	Flint & Walling Manufacturing Co	Attachment for signal towers	480.00
	do	Angle irons, etc	3.00
	The J. F. W. Dorman Co	Rubber type, etc	43.09
	Marine Review Publication Co	Marine Review	54.00
	J. M. Reuss	Services	15.20
	Chicago Great Western Rwy. Co	Passenger transportation	12.30
	Atlantic Coast Line R. R. Co	do	20.50
12	Western Union Telegraph Co	Service	13,938.82
14	Southern Pacific Co	Passenger transportation	9.60
	Peter Gray	Fixtures for electric lanterns	600.00
	do	Electric lanterns	3,400.00
	American Electrical Works	Wire	12.04
	Total		72,499.46

RECAPITULATION.

First quarter	$35,949.47
Second quarter	76,884.16
Third quarter	135,665.88
Fourth quarter	79,797.16
Supplemental	72,499.46
Total	400,796.13

WEATHER BUREAU—GENERAL EXPENSES—SALARIES.

Date.	Name.	Nature of payment.	Total.
1900.			
July 31	O. W. Roberts	Services	$101.10
	M. B. De Vane	do	25.00
	Julius C. Hayden	do	84.20
	Ella W. Daniels	do	25.00
	F. L. Johnson	do	101.10
	Fitzhugh Newman	do	101.10
	Frank R. Beahan	do	101.10
	Joseph Sands	do	60.60
	F. H. Griffin	do	18.59
	E. C. Hobbs	do	101.10
	Wm. E. Donaldson	do	101.10
	Jno. R. Williams	do	101.10
	Jas. A. Barwick	do	101.10
	Thos. Gibson	do	101.10
	Maurice Connell	do	101.10
	Thos. Crawford	do	101.10

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

WEATHER BUREAU—GENERAL EXPENSES—SALARIES—Continued.

Date.	Name.	Nature of payment.	Total.
1900. July 31	J. P. Slaughter	Services	$101.10
	Chas. Adrie	do	84.20
	Jessie A. Brown	do	25.30
	J. J. Killiher	do	84.20
	Marsden Wright	do	84.20
	Jas. P. Piercy	do	101.10
	D. C. Grunow	do	84.20
	M. E. Conway	do	70.80
	C. J. Doherty	do	84.20
	Chas. A. Hyle	do	84.20
	H. W. Grasse	do	84.20
	A. W. Kennie	do	25.00
	A. J. Davis	do	84.20
	Geo. W. Scott	do	101.10
	J. J. Dosher	do	60.60
	W. U. Simons	do	109.50
	F. Z. Gosewisch	do	101.10
	H. B. Dick	do	84.20
	Hal P. Hardin	do	84.20
	Jno. J. McLean	do	101.10
	Chas. W. Ling	do	84.20
	Robt. L. Anderson	do	84.20
	O. D. Stewart	do	101.10
	Jos. P. Bolton	do	101.10
	Aaron H. Bell	do	101.10
	N. D. Lane	do	101.10
	J. P. Fallihee	do	60.60
	U. G. Myers	do	101.10
	Geo. F. Todd	do	101.10
	Fredk. H. Brandenburg	do	151.60
	Julius M. Sherier	do	109.50
	Wm. L. Bell	do	42.10
	Geo. Reeder	do	101.10
	Jno. W. Byram	do	101.10
	Wayland Bailey	do	84.20
	Geo. L. Lovette	do	25.00
	W. L. Day	do	101.10
	Benj. M. Jacobs	do	25.30
	Ferd. J. Walz	do	151.60
	W. C. McGuiness	do	84.20
	Balf D. Johnson	do	25.00
	Albert Brand	do	101.10
	Jno. J. O'Donnell	do	84.20
	Geo. W. Eddey	do	101.10
	Eliz. L. Renoe	do	25.00
	W. A. Shaw	do	101.10
	U. G. Purssell et al	Salaries	131.40
	Chas. E. Linney et al	do	518.30
	Jas. J. Gray et al	do	224.00
	W. H. Fallon et al	do	158.17
	Thorp B. Jennings et al	do	166.80
	W. S. Currier et al	do	218.70
	Geo. Hass Hagen et al	do	131.40
	Jno. S. Hazen et al	do	141.50
	M. E. Blystone et al	do	216.77
	Chas. Stewart et al	do	193.70
	D. P. McCallum et al	do	131.40
	Geo. N. Salisbury et al	do	298.30
	Alex J. Mitchell et al	do	227.50
	Patck. Connor et al	do	311.70
	W. M. Fulton et al	do	151.70
	Robt. H. Dean et al	do	131.40
	C. F. Schneider et al	do	197.20
	Robt. Q. Grant et al	do	126.10
	Geo. A. Loveland et al	do	373.30
	Edw. B. Richards et al	do	384.46
	Geo. E. Franklin et al	do	230.60
	Henry B. Hursey et al	do	448.10
	Geo. N. Wilson et al	do	131.40
	T. S. Collins et al	do	131.40
	Henry R. Patrick et al	do	131.40
	Saml. C. Emery et al	do	323.30
	Lee A. Denson et al	do	131.40
	W. M. Wilson et al	do	512.00
	Thos. S. Outram et al	do	448.13
	Frank P. Chaffee et al	do	328.60
	Wm. M. Dudley et al	do	163.36
	Henry P. Boyer et al	do	237.20
	Alex. G. Burns et al	do	139.80
	Robt. M. Hardinge et al	do	210.60

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

WEATHER BUREAU—GENERAL EXPENSES—SALARIES—Continued.

Date.	Name.	Nature of payment.	Total.
1900.			
July 31	Geo. H. Willson et al	Salaries	$591.30
	E. C. Thompson et al	do	131.40
	Ford A. Carpenter et al	do	131.10
	Allen Buell et al	do	131.40
	L. H. Murdock et al	do	328.60
	P. F. Lyons et al	do	294.80
	Robt. J. Hyatt et al	do	438.00
	Orin Parker et al	do	193.70
	Edw. A. Evans et al	do	387.40
	C. F. von Herrmann et al	do	382.50
	Arthur B. Wallaber et al	do	365.60
	Edw. P. Jones et al	do	210.60
	Wm. J. Olds et al	do	126.40
	Frank Ridgway et al	do	361.90
	O. C. Borrows et al	do	114.50
	Luther M. Dey et al	do	614.90
	W. G. Burns et al	do	210.60
	M. J. Wright, jr., et al	do	131.40
	Elisha C. Vose et al	do	268.00
	J. G. Linsley et al	do	131.40
	L. A. Welsh et al	do	323.30
	Chas. M. Strong et al	do	227.50
	E. H. Emery et al	do	571.00
	Wm. T. Blythe et al	do	530.60
	L. M. Tarr et al	do	161.40
	Edw. W. McGann et al	do	156.70
	Henry C. Bate et al	do	438.00
	Wm. W. Neifert et al	do	215.60
	A. F. Sims et al	do	227.50
	Fenton H. Duff et al	do	126.10
	Jno. B. Marbury et al	do	350.30
	David Fisher et al	do	131.40
	O. L. Fassig et al	do	417.60
	F. H. Clarke et al	do	141.10
	Byron H. Bronson et al	do	240.90
	Saml. M. Blandford et al	do	240.90
	J. W. Smith et al	do	600.30
	David Cuthbertson et al	do	375.60
	P. H. Smyth et al	do	224.00
	C. P. Cronk et al	do	160.00
	Jas. H. Smith et al	do	139.50
	L. N Jesunofsky et al	do	151.40
	Chas. Davis et al	do	141.10
	L. M. Pindell et al	do	224.00
	Walter S. Palmer et al	do	235.60
	Jas. Kenealy et al	do	441.80
	S. S. Bassler et al	do	443.10
	A. E. Hackett et al	do	222.20
	Jas. W. Bauer et al	do	156.70
	J. Warren Smith et al	do	402.30
	Henry A. McNally et al	do	354.88
	Geo. M. Chappel et al	do	409.30
	N. B. Conger et al	do	603.20
	Edw. H. Bowie et al	do	126.10
	Herbert W. Richardson et al	do	251.00
	Danl. C. Murphy et al	do	131.40
	Albert Ashenberger et al	do	131.40
	Chas. J. Considine et al	do	210.60
	Geo. B. Wurtz et al	do	126.10
	E. H. Nimmo et al	do	126.10
	Geo. G. Harkness et al	do	101.10
	Louis G. Schultz et al	do	131.40
	I. M. Cline et al	do	430.38
	G. W. Felger et al	do	131.10
	F. W. Conrad et al	do	131.40
	E. R. Demain et al	do	139.80
	Saml. L. Dosher et al	do	134.70
	Elwin J. Glass et al	do	240.90
	S. W. Glenn et al	do	240.90
	C. F. R. Wappenhaus et al	do	446.40
	Robt. G. Allen et al	do	292.50
Aug. 2	H. E. Wilkinson et al	do	192.63
17	B. P. Heubner	Services	19.57
	M. Santour	do	29.03
	J. K. Ward	do	24.00
	Ray Stahl	do	29.35
20	McL. S. Collom	do	6.85
	Geo. E. Babcock	do	9.00
	do	do	13.00
	Edwin S. Ely	do	3.23

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

WEATHER BUREAU—GENERAL EXPENSES—SALARIES—Continued.

Date.	Name.	Nature of payment.	Total.
1900.			
Aug. 24	Geo. A. Klein	Services	$15.00
	A. W. Thompson	do	12.50
	Otto B. Hart	do	46.00
	J. K. Ward	do	10.00
	W. R. Webb	do	40.00
31	Otto B. Hart	do	48.91
	Geo. T. Todd	do	101.10
	J. P. Slaughter	do	101.10
	Thos. Crawford	do	101,10
	Maurice Connell	do	101.10
	Thos. Gibson	do	101.10
	Jas. A. Barwick	do	101.10
	Ford. A. Carpenter	do	101.10
	Jno. R. Williams	do	101.10
	Eliz. L. Renoe	do	25.00
	Jos. P. Bolton	do	101.10
	Oscar D. Stewart	do	101.10
	R. L. Anderson	do	84.20
	Chas. W. Ling	do	84.20
	Jno. J. McLean	do	101.10
	Hal P. Hardin	do	84.20
	Harvey B. Dick	do	84.20
	F. Z. Gossewisch	do	101.10
	W. N. Simons	do	109.50
	Jos. J. Dosher	do	60.60
	Geo. W. Scott	do	101.10
	Albert W. Kenney	do	25.00
	H. W. Grasse	do	84.20
	Albert Brand	do	101.10
	W. C. McGuiness	do	84.20
	Benj. M. Jacobs	do	25.30
	W. L. Day	do	101.10
	Geo. L. Lovett	do	25.00
	Wayland Bailey	do	84.20
	Jno. W. Byram	do	101.10
	Geo. Reeder	do	101.10
	Geo. W. Eddey	do	101.10
	Jno. J. O'Donnell	do	84.20
	Balf. D. Johnson	do	25.00
	Emma D. Sharpe	do	25.00
	M. W. DeVane	do	25.00
	Geo. R. Oberholzer	do	98.37
	Jos. Sands	do	60.60
	Frank R. Beahan	do	101.10
	Fitzhugh Newman	do	101.10
	F. L. Johnson	do	101.10
	Ella W. Daniels	do	25.00
	Julius C. Hayden	do	84.20
	W. J. Bennett	do	70.80
	M. E. Conway	do	70.80
	D. C. Grunaw	do	84.20
	Wm. A. Shaw	do	101.10
	Jos. C. Piercy	do	101.10
	Marsden Wright	do	84.20
	J. J. Kelliher	do	84.20
	Chas. Adie	do	84.20
	Wm. L. Bell	do	42.10
	J. M. Sherier	do	109.50
	U. G. Myers	do	101.10
	J. P. Fallihee	do	60.60
	N. D. Lane	do	101.10
	Aaron H. Bell	do	101.10
	Jno. B. Marbury et al	Salaries	266.10
	E. B. Richards et al	do	403.04
	Alfred F. Sims et al	do	227.50
	Fenton H. Duff et al	do	126.10
	David Fisher et al	do	131.40
	O. L. Fassig et al	do	417.60
	J. H. Clarke et al	do	141.10
	Byron H. Bronson et al	do	240.90
	Saml. M. Blandford et al	do	240.90
	J. W. Smith et al	do	701.40
	David Cuthbertson et al	do	375.60
	P. H. Smyth et al	do	224.00
	C. P. Cronk et al	do	160.00
	Jas. H. Smith et al	do	139.50
	Lewis N. Jesunofsky et al	do	151.40
	Chas. Davis et al	do	141.10
	L. M. Pindell et al	do	224.00
	W. S. Palmer et al	do	240.90

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

WEATHER BUREAU—GENERAL EXPENSES—SALARIES—Continued.

Date.	Name.	Nature of payment.	Total.
1900.			
Aug. 31	S. S. Bassler et al	Salaries	$443.10
	Jas. Kenealy et al	do	446.40
	A. E. Hackett et al	do	222.20
	Jacob W. Bauer et al	do	156.70
	J. W. Smith et al	do	402.30
	F. H. Brandenberg et al	do	508.80
	Geo. M. Chappell et al	do	409.30
	N. B. Conger et al	do	603.20
	Edw. H. Bowie et al	do	126.10
	H. W. Richardson et al	do	251.00
	Danl. C. Murphy et al	do	131.40
	Albert Ashenberger et al	do	131.40
	Thos. J. Considine et al	do	210.60
	Geo. B. Wurtz et al	do	126.10
	E. H. Nimmo et al	do	126.10
	Jno. R. Weeks et al	do	131.40
	L. G. Schultz et al	do	131.40
	L. M. Dey et al	do	628.30
	O. C. Burrows et al	do	114.50
	Frank Ridgway et al	do	367.20
	W. J. Olds et al	do	126.40
	Edwd. P. Jones et al	do	210.60
	Solomon Hyman	Services	15.65
	A. B. Wallaber et al	Salaries	365.60
	C. F. von Herrmann et al	do	382.50
	E. A. Evans	do	387.40
	Orin Parker	do	193.70
	Robt. J. Hyatt	do	438.00
	P. F. Lyons	do	210.60
	L. H. Murdock	do	328.60
	Allen Buell	do	131.40
	E. C. Thompson	do	131.40
	Geo. H. Willson	do	520.50
	R. M. Hardinge	do	210.60
	Alex G. Burns	do	139.80
	H. B. Boyer	do	250.60
	W. E. Donaldson	do	131.40
	Geo. N. Salisbury	do	298.30
	D. P. McCallum et al	do	131.40
	U. G. Purssell et al	do	215.60
	Chas. Stewart et al	do	193.70
	M. E. Blystone et al	do	229.19
	Jno. S. Hazen et al	do	141.50
	E. C. Hobbs et al	do	131.40
	W. S. Currier et al	do	218.70
	Thorp B. Jennings et al	do	166.80
	W. S. Belden et al	do	264.50
	G. W. Felger et al	do	171.90
	Jas. J. Gray et al	do	224.00
	Geo. Hass Hagen et al	do	121.62
	T. S. Collins et al	do	154.88
	Henry R. Patrick et al	do	131.40
	S. C. Emery et al	do	306.40
	Lee A. Denson et al	do	131.40
	W. M. Wilson et al	do	512.00
	Thos. S. Outram et al	do	451.40
	W. M. Dudley et al	do	202.20
	F. P. Chaffee et al	do	312.58
	Geo. E. Grimes et al	do	114.50
	Henry C. Bate et al	do	438.00
	E. W. McGann et al	do	156.70
	L. M. Tarr et al	do	161.40
	W. T. Blythe et al	do	530.60
	E. H. Emery et al	do	571.00
	Lucius A. Welsh et al	do	323.30
	Chas. M. Strong et al	do	227.50
	Julius G. Linsley et al	do	131.40
	Elisha C. Vose et al	do	268.00
	Marcus J. Wright, jr., et al	do	131.40
	Wm. G. Burns et al	do	241.88
	I. M. Cline et al	do	423.57
	W. H. Fallon et al	do	131.10
	F. W. Conrad et al	do	131.40
	E. R. Demain et al	do	139.80
	Saml. L. Dosher et al	do	134.70
	Elvin J. Glass et al	do	240.90
	Robt. B. Harkness et al	do	131.40
	S. W. Glenn et al	do	240.90
	Robt. G. Allen et al	do	292.50
	C. F. R. Wappenhaus et al	do	446.40

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

WEATHER BUREAU—GENERAL EXPENSES—SALARIES—Continued.

Date.	Name.	Nature of payment.	Total.
1900.			
Aug. 31	Alex J. Mitchell et al	Salaries	$227.50
	Patrick Connor et al	do	311.70
	W. M. Fulton et al	do	151.70
	Robt. H. Dean et al	do	131.40
	C. F. Schneider et al	do	197.20
	Robt. Q. Grant et al	do	126.10
	Geo. A. Loveland et al	do	373.30
	Geo. E. Franklin et al	do	230.60
	Henry P. Hersey et al	do	448.10
	Geo. N. Wilson et al	do	131.40
	Chas. E. Linney et al	do	589.10
Sept. 17	Orris W. Roberts et al	do	101.10
18	Geo. A. Kleine	Services	9.00
	Clyde Lemon	do	84.20
	do	do	81.48
	Peter C. Campbell	do	5.00
	Cecil A. McCord	do	10.00
20	Albert W. Thompson	do	9.50
30	W. T. Blythe et al	Salaries	513.80
	L. M. Tarr et al	do	157.20
	E. W. McGann et al	do	151.60
	Henry C. Bate et al	do	424.00
	Geo. E. Grimes et al	do	111.00
	Frank P. Chaffee et al	do	317.80
	L. A. Judkins et al	do	277.20
	Thos. L. Outram et al	do	437.20
	Henry R. Patrick et al	do	127.20
	T. S. Collins et al	do	127.20
	Geo. N. Wilson et al	do	127.20
	Geo. E. Franklin et al	do	223.80
	Edw. B. Richards et al	do	399.40
	Geo. A. Loveland et al	do	337.91
	Robt. Q. Grant et al	do	122.80
	Chas. F. Schneider et al	do	190.60
	W. M. Fulton et al	do	146.60
	W. U. Simons et al	do	135.40
	C. F. R. Wappenhaus et al	do	432.20
	Robt. G. Allen et al	do	285.00
	Isaac M. Cline et al	do	325.50
	Jno. R. Weeks et al	do	127.20
	S. W. Glenn et al	do	233.20
	Chas. E. Linney et al	do	571.80
	Lee A. Denson et al	do	101.77
	Robt. B. Harkness et al	do	127.20
	E. J. Glass et al	do	233.20
	F. W. Conrad et al	do	127.20
	W. H. Fallon et al	do	127.80
	E. H. Nimmo et al	do	126.86
	Geo. B. Wurtz et al	do	122.80
	Thos. J. Considine et al	do	203.80
	Daniel C. Murphy et al	do	127.20
	H. W. Richardson et al	do	243.00
	N. B. Conger et al	do	583.60
	Geo. M. Chappell et al	do	396.40
	J. W. Smith et al	do	458.80
	A. E. Hackett et al	do	215.60
	Jas. Kenealy et al	do	432.20
	W. S. Palmer et al	do	233.20
	Lewis M. Pindell et al	do	217.00
	Chas. Davis et al	do	137.80
	David Cuthbertson et al	do	363.80
	J. W. Smith et al	do	682.20
	S. M. Blandford et al	do	233.20
	B. H. Bronson et al	do	233.20
	O. S. Fassig et al	do	404.80
	David Fisher et al	do	127.20
	Jno. B. Marbury et al	do	274.00
	F. H. Duff et al	do	122.80
	A. B. Wallaber et al	do	353.80
	G. W. Felger et al	do	166.20
	Wm. S. Belden et al	do	256.00
	E. C. Hobbs et al	do	127.20
	Jno. S. Hazen et al	do	137.00
	Chas. Stewart et al	do	187.60
	Danl. P. McCallum et at	do	127.20
	Elez. L. Renoe	Services	25.00
	Geo. W. Salisbury et al	Salaries	288.40
	Alex. G. Burns et al	do	135.40
	E. C. Thompson et al	do	127.20

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

WEATHER BUREAU—GENERAL EXPENSES—SALARIES—Continued.

Date.	Name.	Nature of payment.	Total.
1900.			
Sept. 30	Allen Buell et al	Salaries	$127.20
	L. H. Murdock et al	do	317.80
	Robt. J. Hyatt et al	do	424.00
	E. A. Evans et al	do	375.20
	Chas. F. von Herrmann et al	do	370.00
	E. P. Jones et al	do	218.47
	Frank Ridgway et al	do	355.60
	W. G. Burns et al	do	283.20
	M. J. Wright, jr., et al	do	127.20
	Elisha C. Vose et al	do	259.00
	J. G. Linsley et al	do	127.20
	Chas. M. Strong et al	do	220.00
	L. A. Welsh et al	do	313.40
	Jas. J. Gray et al	do	217.00
	T. B. Jennings et al	do	161.40
	Wm. S. Currier et al	do	212.60
	M. E. Blystone et al	do	233.20
	U. G. Purssell et al	do	127.20
	Wm. E. Donaldson et al	do	127.20
	Harry B. Boyer et al	do	243.80
	Robt. M. Hardinge et al	do	203.80
	Geo. H. Willson et al	do	572.40
	F. A. Carpenter et al	do	127.20
	Patrick F. Lyons et al	do	285.40
	Orin Parker et al	do	187.60
	Wm. J. Olds et al	do	122.20
	O. C. Burrows et al	do	111.00
	L. M. Dey et al	do	608.40
	E. H. Emery et al	do	553.00
	Dexter C. Grunow et al	do	140.40
	W. M. Wilson et al	do	512.20
	Saml. C. Emery et al	do	231.84
	Marsden Wright	Services	81.60
	Geo. H. Hagen	do	97.80
	Henry B. Hersey et al	Salaries	433.80
	Robt. H. Dean et al	do	127.20
	Patrick Connor et al	do	301.60
	Alex. J. Mitchell et al	do	220.00
	Saml. L. Dosher et al	do	130.60
	E. R. Demain et al	do	135.40
	F. H. Brandenberg et al	do	424.00
	Jacob W. Bauer et al	do	151.60
	S. S. Bassler et al	do	360.40
	L. N. Jesunofsky et al	do	147.20
	C. P. Cronk et al	do	155.00
	P. H. Smyth et al	do	217.00
	F. H. Clarke et al	do	137.80
	A. F. Sims et al	do	220.00
	J. C. Hayden	Services	81.60
	Ella W. Daniels	do	25.00
	Fitzhugh Newman	do	97.80
	Frank R. Beahan	do	97.80
	Jos. Sands	do	58.80
	Jno. R. Williams	do	97.80
	Jas. A. Barwick	do	97.80
	Thos. Gibson	do	97.80
	Maurice Connell	do	97.80
	J. P. Slaughter	do	97.80
	Chas. Adie	do	81.60
	Emma D. Sharpe	do	25.00
	J. J. Kelliher	do	81.60
	Thos. Crawford	do	97.80
	Jno. C. Piercy	do	97.80
	M. E. Conway	do	68.40
	H. W. Grasse	do	81.60
	Fredk. G. Gossewisch	do	97.80
	Harvey B. Dick	do	81.60
	Hal B. Hardin	do	81.60
	Jno. J. McLean	do	97.80
	Geo. T. Todd	do	97.80
	E. H. Bowie	do	97.80
	R. L. Anderson	do	81.60
	C. W. Ling	do	81.60
	Aaron H. Bell	do	97.80
	U. G. Myers	do	97.80
	Julius M. Sherier	do	106.00
	Alpheus Drinkwater	do	40.80
	Geo. Reeder	do	97.80
	J. W. Byram	do	97.80
	Wm. B. Schlomer	do	68.40

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

WEATHER BUREAU—GENERAL EXPENSES—SALARIES—Continued.

Date.	Name.	Nature of payment.	Total.
1900.			
Sept. 30	Benj. M. Jacobs	Services	$24.40
	W. C. McGuiness	do	81.60
	Albert Brand	do	97.80
	Jno. J. O'Donnell	do	81.60
	Geo. W. Eddey	do	97.80
	N. D. Lane	do	97.80
	Orris W. Roberts	do	97.80
	F. L. Johnson	do	97.80
	W. A. Shaw	do	97.80
	Walter J. Bennett	do	68.40
	Albert W. Kennie	do	25.00
	Clyde Lemon	do	81.60
	Geo. W. Scott	do	97.80
	J. J. Dosher	do	58.80
	O. D. Stewart	do	97.80
	Jos. P. Bolton	do	97.80
	Albert Ashenberger	do	97.80
	J. P. Fallihee	do	58.80
	W. L. Chaney	do	14.16
	Wayland Bailey	do	81.60
	Jas. H. Smith	do	106.00
	Geo. L. Lovett	do	25.00
	Walcott L. Day	do	97.80
	Balfe D. Johnson	do	25.00
	Total first quarter		96,299.78
Oct. 3	Louis G. Schultz et al	Salaries	117.42
13	Cecil H. McCord	Service	20.00
16	Geo. A. Klein	do	12.00
	Wm. W. Christman	do	26.59
	Jos. S. Farmer	do	22.00
	Harry B. Nichols	do	9.83
18	Walter W. Thomas	do	15.98
25	Guy C. Harris	do	18.36
	Erle Adams	do	9.00
	C. W. Kennedy	do	20.00
	Wm. Bergman	do	24.00
26	Robt. E. Glenn	do	5.00
	do	do	2.50
	Jno. C. Foster	do	17.00
31	G. W. Eddey	do	101.10
	L. A. Judkins	do	84.20
	Albert Brand	do	101.10
	W. C. McGuiness	do	84.20
	Jno. J. O'Donnell	do	84.20
	Benj. L. Miller	do	18.55
	Benj. M. Jacobs	do	25.30
	W. L. Day	do	101.10
	Geo. L. Lovett	do	25.00
	W. Bailey	do	84.20
	Jno. W. Byram	do	101.10
	Geo. Reeder	do	101.10
	Alpheus Drinkwater	do	42.10
	Julius M. Sherier	do	109.50
	Geo. T. Todd	do	101.10
	U. G. Myers	do	101.10
	J. P. Fallihee	do	60.60
	Albert Ashenberger	do	101.10
	N. D. Lane	do	101.10
	Aaron H. Bell	do	101.10
	Eliz. L. Renoe	do	25.00
	Jno. P. Bolton	do	101.10
	Chas. E. Holmes	do	57.07
	O. D. Stewart	do	101.10
	Robt. L. Anderson	do	84.20
	Chas. W. Ling	do	84.20
	Jno. J. McLean	do	101.10
	Hal P. Hardin	do	84.20
	Harry B. Dick	do	84.20
	F. Z. Gossewisch	do	101.10
	Jno. J. Dosher	do	60.60
	Geo. W. Scott	do	101.10
	F. L. McClintic	do	84.20
	M. J. Driscoll	do	16.63
	Albert W. Kennie	do	25.00
	H. W. Grasse	do	84.20
	W. J. Bennett	do	70.80
	M. E. Conway	do	70.80
	W. A. Shaw	do	101.10

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

WEATHER BUREAU—GENERAL EXPENSES—SALARIES—Continued.

Date.	Name.	Nature of payment.	Total.
1900.			
Oct. 31	Jos. C. Piercy	Service.	$101.10
	Morton Brown	do	54.82
	Marsden Wright	do	84.20
	Wm. G. Burns	do	126.40
	J. J. Kelliher	do	84.20
	Emma D. Sharpe	do	25.00
	Chas. Adie	do	84.20
	J. P. Slaughter	do	101.10
	R. E. Pollock	do	37.50
	Wm. J. Buhmann	do	30.00
	W. J. Cowley	do	61.20
	C. A. McCord	do	30.00
	Orris W. Roberts	do	101.10
	J. C. Hayden	do	84.20
	Ella W. Daniels	do	25.00
	F. L. Johnson	do	101.10
	Fitzhugh Newman	do	101.10
	F. R. Brehan	do	101.10
	Jos. Sands	do	60.60
	Geo. H. Hagen	do	101.10
	Jno. R. Williams	do	101.10
	Jas. A. Barwick	do	101.10
	Thos. Gibson	do	101.10
	Maurice Connell	do	101.10
	Wm. D. Maxwell	do	101.10
	Marcus J. Wright, jr	do	101.10
	A. F. Sims et al	Salaries	227.50
	F. H. Duff et al	do	126.10
	Jno. B. Marbury et al	do	283.00
	David Fisher et al	do	131.40
	O. L. Fassig et al	do	392.30
	F. H. Clarke et al	do	141.10
	B. H. Bronson et al	do	240.90
	S. M. Blandford et al	do	240.90
	J. W. Smith et al	do	641.40
	D. Cuthbertson et al	do	375.60
	P. H. Smyth et al	do	210.60
	C. P. Cronk et al	do	133.96
	Jas. H. Smith et al	do	180.30
	L. N. Jesofnsky et al	do	151.40
	Chas. Davis et al	do	141.10
	L. M. Pindell et al	do	224.00
	Walter S. Palmer et al	do	240.90
	S. S. Bassler et al	do	443.10
	Jas. Kenealy et al	do	446.40
	A. E. Hackett et al	do	247.20
	Jacob W. Bauer et al	do	156.70
	J. W. Smith et al	do	402.30
	F. H. Brandenburg et al	do	367.20
	Geo. M. Chappell et al	do	409.30
	N. B. Conger et al	do	603.20
	E. A. Bowie et al	do	131.40
	H W. Richardson et al	do	251.00
	L. M. Dey et al	do	628.30
	O. C. Burrows et al	do	114.50
	Frank Ridgway et al	do	353.80
	W. J. Olds et al	do	126.40
	Edwd. P. Jones et al	do	222.34
	A. B. Wallaber et al	do	365.60
	C. F. Von Herrmann et al	do	382.50
	Edw. A. Evans et al	do	387.40
	Orin Parker et al	do	193.70
	Robt. J. Hyatt et al	do	451.40
	P. F. Lyons et al	do	294.80
	L. H. Murdock et al	do	328.60
	Allen Buell et al	do	131.40
	Ford A. Carpenter et al	do	131.40
	Edwin C. Thompson et al	do	131.40
	Geo. H. Willson et al	do	591.30
	Robt. M. Hardinge et al	do	210.60
	Alex. G. Burns et al	do	139.80
	Harry B. Boyer et al	do	250.60
	W. E. Donaldson et al	do	131.40
	Geo. N. Salisbury et al	do	298.30
	D. P. McCallum et al	do	131.40
	N. G. Purssell et al	do	131.40
	Chas. Stewart et al	do	193.70
	M. E. Blystone et al	do	240.90
	Jno. S. Hazen et al	do	141.50
	E. C. Hobbs et al	do	131.40

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

WEATHER BUREAU—GENERAL EXPENSES—SALARIES—Continued.

Date.	Name.	Nature of payment.	Total.
1900.			
Oct. 31	Wm. S. Currier et al	Salaries	$218.70
	T. B. Jennings et al	do	166.80
	W. S. Belden et al	do	264.50
	G. W. Felger et al	do	171.90
	A. J. Mitchell et al	do	227.50
	Saml. C. Emery et al	do	240.90
	H. B. Hersey et al	do	448.10
	C. F. R. Wappenhaus et al	do	446.40
	C. M. Strong et al	do	227.50
	E. W. McGann et al	do	156.70
	Edw. B. Richards et al	do	412.80
	Elisha C. Vose et al	do	268.00
	Thos. S. Outram et al	do	451.40
	Lee A. Denson et al	do	131.40
	Julius G. Linsley et al	do	131.40
	Eben H. Emery et al	do	571.00
	Lucius A. Welsh et al	do	323.30
	Dexter C. Grunow et al	do	144.80
	W. M. Wilson et al	do	528.90
	Geo. B. Wurtz et al	do	126.10
	Jas. J. Gray et al	do	213.24
	W. T. Blythe et al	do	510.08
	Henry C. Bates et al	do	438.00
	Geo. E. Grimes et al	do	114.50
	Frank P. Chaffee et al	do	328.60
	W. M. Dudley et al	do	166.33
	Henry R. Patrick et al	do	131.40
	T. S. Collins et al	do	115.77
	Geo. N. Wilson et al	do	131.40
	Geo. E. Franklin et al	do	230.60
	Geo. A. Loveland et al	do	348.60
	Robt. Q. Grant et al	do	126.10
	W. M. Fulton et al	do	151.70
	W. U. Simons et al	do	139.80
	Patrick Conner et al	do	311.70
	Robert G. Allen et al	do	292.50
	S. W. Glenn et al	do	240.90
	Robt. B. Harkness et al	do	131.40
	Elvin J. Glass et al	do	240.90
	Saml. L. Dosher et al	do	134.70
	E. R. Demain et al	do	139.80
	F. W. Conrad et al	do	131.40
	W. H. Fallon et al	do	131.10
	Louis G. Schultz et al	do	131.40
	Jno. R. Weeks et al	do	131.40
	E. H. Nimmo et al	do	131.40
	Thos. J. Considine et al	do	210.60
	D. C. Murphy et al	do	131.40
	I. M. Cline et al	do	323.50
	L. M. Dey, jr., et al	do	120.72
	Robt. H. Dean et al	do	131.40
	Chas. F. Schneider et al	do	197.20
	L. M. Tarr et al	do	161.40
	C. E. Linney et al	do	589.10
Nov. 2	Balf. D. Johnson	Services	25.00
8	Early G. Colvin	do	1.96
	Cecil A. McCord	do	9.00
12	Camden W. Kennedy	do	19.00
	Robt. C. Garber	do	8.00
20	J. Garland Miller	do	10.50
23	Mathew B. De Vane	do	19.17
30	W. S. Belden et al	Salaries	256.00
	Luther M. Dey et al	do	608.40
	M. J. Wright, jr., et al	do	137.00
	Elisha C. Vose et al	do	259.00
	Julius G. Linsley et al	do	127.20
	L. A. Welsh et al	do	313.40
	Chas. M. Strong et al	do	220.00
	Jas. J. Gray et al	do	212.11
	Eben H. Emery et al	do	553.00
	W. T. Blythe et al	do	512.77
	L. M. Tarr et al	do	133.20
	Edw. W. McGann et al	do	151.60
	Dexter C. Grunow et al	do	140.40
	Henry C. Bate et al	do	424.00
	Geo. A. Willson et al	do	572.40
	Robt. M. Hardinge et al	do	263.80
	Alex. G. Burns et al	do	135.40
	Harry B. Boyer et al	do	243.80
	Geo. N. Salisbury et al	do	288.40

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

WEATHER BUREAU—GENERAL EXPENSES—SALARIES—Continued.

Date.	Name.	Nature of payment.	Total.
1900.			
Nov. 30	Danl. P. McCallum et al	Salaries	$127.20
	U. G. Purssell et al	do	127.20
	Chas. Stewart et al	do	187.60
	M. E. Blystone et al	do	233.20
	Jno. S. Hazen et al	do	137.00
	E. C. Hobbs et al	do	127.20
	Geo. H. Hagen et al	do	127.20
	Wm. S. Currie et al	do	212.60
	T. B. Jennings et al	do	161.40
	G. W. Felger et al	do	166.20
	O. C. Burrows et al	do	111.00
	Frank Ridgway et al	do	342.40
	Wm. J. Olds et al	do	122.20
	Edwd. P. Jones et al	do	203.80
	Arthur P. Wallaber et al	do	353.80
	C. F. von Herrmann et al	do	370.00
	E. A. Evans et al	do	375.20
	Orin Parker et al	do	187.60
	Robt. J. Hyatt et al	do	437.20
	P. F. Lyons et al	do	285.40
	L. H. Murdock et al	do	317.80
	Allen Buell et al	do	127.20
	Ford A. Carpenter et al	do	127.20
	E. C. Thompson et al	do	127.20
	Chas. E. Linney et al	do	571.80
	R. H. Dean et al	do	127.20
	R. Q. Grant et al	do	122.80
	Geo. A. Loveland et al	do	337.80
	E. B. Richards et al	do	399.40
	Geo. E. Franklin et al	do	223.80
	Geo. N. Wilson et al	do	127.20
	T. S. Collins et al	do	127.20
	Henry R. Patrick et al	do	127.20
	Saml. E. Emery et al	do	233.20
	Lee A. Denson et al	do	127.20
	Thos. S. Outram et al	do	437.20
	W. M. Dudley et al	do	195.60
	Frank P. Chaffee et al	do	317.80
	Geo. E. Grimes et al	do	111.00
	Alfred S. Sims et al	do	220.00
	Fenton H. Duff et al	do	122.80
	Jno. B. Marbury et al	do	355.60
	D. Fisher et al	do	127.20
	O. L. Fassig et al	do	405.40
	F. H. Clarke et al	do	137.80
	B. H. Bronson et al	do	233.20
	Saml. M. Blandford et al	do	233.20
	J. W. Smith et al	do	622.20
	David Cuthbertson et al	do	363.80
	P. H. Smyth et al	do	203.80
	Jas. H. Smith et al	do	174.40
	L. N. Jesunofsky et al	do	147.20
	Chas. Davis et al	do	137.80
	Lewis M. Pindell et al	do	217.00
	W. S. Palmer et al	do	233.20
	S. S. Bassler et al	do	428.80
	Jas. Kenealy et al	do	432.20
	A. E. Hakett et al	do	240.60
	Jacob W. Bauer et al	do	151.60
	J. W. Smith et al	do	390.40
	F. H. Brandenburg et al	do	355.60
	Geo. W. Chappell et al	do	396.40
	N. B. Conger et al	do	515.20
	Edw. H. Bowie et al	do	127.20
	H. W. Richardson et al	do	243.00
	Danl. C. Murphy et al	do	127.20
	Thos. J. Considine et al	do	203.80
	Geo. B. Wurtz et al	do	122.80
	E. H. Nimmo et al	do	127.20
	Louis G. Schultz et al	do	127.20
	I. M. Cline et al	do	332.50
	W. H. Fallon et al	do	127.80
	F. W. Conrad et al	do	127.20
	E. R. Demain et al	do	135.40
	Saml. L. Dosher et al	do	130.60
	E. J. Glass et al	do	233.20
	R. B. Harkness et al	do	127.20
	S. W. Glenn et al	do	233.20
	C. F. R. Wappenhaus et al	do	432.20
	Robt. G. Allen et al	do	260.00

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

WEATHER BUREAU—GENERAL EXPENSES—SALARIES—Continued.

Date.	Name.	Nature of payment.	Total.
1900.			
Nov. 30	A. J. Mitchell et al	Salaries	$220.00
	Patck. Conner et al	do	301.60
	W. U. Simons et al	do	135.40
	W. M. Fulton et al	do	146.60
	Jno. R. Weeks et al	do	127.20
	H. B. Hersey et al	do	433.80
	W. M. Wilson et al	do	512.20
	W. E. Donaldson et al	do	121.33
	C. F. Schneider et al	do	190.60
	Richd. A. J. Curtin	Services	16.63
	Sumner Hackett	do	39.20
	O. W. Roberts	do	97.80
	Julius C. Hayden	do	81.60
	Ella W. Daniels	do	25.00
	F. L. Johnson	do	97.80
	Fitzhugh Newman	do	97.80
	F. R. Beahan	do	97.80
	Jos. Sands	do	58.80
	Jno. R. Williams	do	97.80
	J. A. Barwick	do	97.80
	Thos. Gibson	do	97.80
	Maurice Connell	do	97.80
	W. D. Maxwell	do	97.80
	J. P. Slaughter	do	25.00
	Emma D. Sharpe	do	81.60
	J. J. Kelliher	do	81.60
	Luther M. Dey, jr	do	122.20
	W. G. Burns	do	81.60
	Marsden Wright	do	97.80
	Jos. C. Piercy	do	97.80
	Wm. A. Shaw	do	68.40
	M. E. Conway	do	68.40
	Hugh Legler	do	81.60
	H. W. Grasse	do	25.00
	A. W. Kinnie	do	81.60
	F. L. McClintic	do	97.80
	Geo. W. Scott	do	58.80
	Jas. J. Dosher	do	97.80
	F. Z. Gossewisch	do	81.60
	Harvey B. Dick	do	81.60
	Hal P. Hardin	do	97.80
	Jno. J. McLean	do	81.60
	Chas. W. Ling	do	81.60
	Robt. L. Anderson	do	97.80
	Oscar D. Stewart	do	97.80
	Jos. L. Cline	do	97.80
	Jos. B. Bolton	do	25.00
	Eliz. L. Renoe	do	97.80
	A. H. Bell	do	97.80
	Albert Ashenberger	do	97.80
	U. G. Myers	do	58.80
	J. P. Fallihee	do	97.80
	Geo. T. Todd	do	106.00
	Julius M. Sherier	do	40.80
	Alpheus Drinkwater	do	97.80
	Geo. Reeder	do	81.60
	Wayland Bailey	do	97.80
	John W. Byram	do	25.00
	Geo. L. Lovett	do	106.00
	C. P. Cronk	do	97.80
	W. L. Day	do	24.40
	Benj. M. Jacobs	do	81.60
	W. C. McGuiness	do	97.80
	Albert Brand	do	81.60
	Jno. J. O'Donnell	do	97.80
	Geo. W. Eddey	do	97.80
	N. D. Lane	do	25.00
	Balfe D. Johnson	do	28.42
	Ray C. Johnson	do	4.00
	R. E. Glenn	do	45.00
	J. J. Beard	do	26.55
	Jno. C. Foster	do	6.77
	H. McP. Baldwin	do	26.00
Dec. 11	Camden W. Kennedy	do	3.00
17	R. E. Glenn	do	9.00
	do	do	12.48
	Mary G. Tarr	do	68.40
	Fred. W. Brist	do	15.00
	Robt. O. Cook, jr	do	74.56
18	Chas. Adie	do	

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

WEATHER BUREAU—GENERAL EXPENSES—SALARIES—Continued.

Date.	Name.	Nature of payment.	Total.
1900.			
Dec. 19	Wm. J. Buhmann	Services	$20.50
31	W. J. Crowley	do	70.38
	Richd. M. Geddings	do	35.87
	Geo. W. Eddey	do	101.10
	Jno. D. Blagden	do	84.20
	B. D. Johnson	do	25.00
	Albert Brand	do	101.10
	W. C. McGuiness	do	84.20
	Benj. F. Jacobs	do	25.30
	W. C. Day	do	101.10
	C. P. Cronk	do	109.50
	Geo. L. Lovett	do	25.00
	Wayland Bailey	do	84.20
	Jno. W. Byram	do	101.10
	Alpheus Drinkwater	do	42.10
	J. M. Sherier	do	109.50
	Geo. T. Todd	do	101.10
	U. G. Myers	do	101.10
	J. P. Fallihee	do	60.60
	A. H. Bell	do	101.10
	Eliz. L. Renoe	do	25.00
	J. P. Bolton	do	101.10
	O. D. Stewart	do	101.10
	R. L. Anderson	do	84.20
	Chas. W. Ling	do	84.20
	Jno. J. McLean	do	101.10
	Hal P. Hardin	do	84.20
	Harvey B. Dick	do	84.20
	F. Z. Gossewisch	do	101.10
	Geo. W. Scott	do	101.10
	F. L. McClintic	do	84.20
	H. W. Grasse	do	84.20
	Hugh Legler	do	70.80
	M. C. Conway	do	70.80
	W. A. Shaw	do	101.10
	Jno. C. Piercy	do	101.10
	J. C. Kelliher	do	84.20
	Emma D. Sharpe	do	25.00
	Chas. Adie	do	70.80
	W. D. Maxwell	do	101.10
	Maurice Connell	do	101.10
	Thos. Gibson	do	101.10
	Jas. A. Barwick	do	101.10
	Jno. R. Williams	do	101.10
	Chas. Stewart	do	109.50
	Jos. Sands	do	60.60
	Frank R. Beahan	do	101.10
	Fitzhugh Newman	do	101.10
	F. L. Johnson	do	101.10
	Ella W. Daniels	do	25.00
	Julius C. Hayden	do	84.20
	Orris W. Roberts	do	101.10
	Estate of Theo. Bornkassell	do	21.74
	Marsden Wright	do	76.84
	Sumner Hackett	do	40.40
	N. D. Lane	do	101.10
	Jos. J. Dosher	do	60.60
	A. W. Kennie	do	25.00
	J. P. Slaughter	do	101.10
	Allen Buell et al	Salaries	113.82
	Patrick Conner et al	do	319.05
	E. H. Emery et al	do	571.00
	E. A. Evans et al	do	387.40
	Geo. H. Hagan et al	do	131.40
	Chas. E. Linney et al	do	589.10
	W. G. Burns et al	do	240.90
	O. C. Burrows et al	do	114.50
	Frank Ridgway et al	do	353.80
	Wm. J. Olds et al	do	126.40
	E. P. Jones et al	do	240.90
	A. B. Wallaber et al	do	365.60
	C. F. von Herrmann et al	do	382.50
	Orin Parker et al	do	193.70
	Robt. J. Hyatt et al	do	421.10
	Patk. F. Lyons et al	do	294.80
	L. H. Murdock et al	do	328.60
	Ford A. Carpenter et al	do	131.40
	E. C. Thompson et al	do	131.40
	Geo. H. Willson et al	do	591.30
	Robt. M. Hardinge et al	do	210.60

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

WEATHER BUREAU—GENERAL EXPENSES—SALARIES—Continued.

Date.	Name.	Nature of payment.	Total.
1900.			
Dec. 31	Alex. G. Burns et al	Salaries	$139.80
	Harry B. Boyer et al	do	250.60
	Geo. N. Salisbury et al	do	298.30
	Danl. P. McCallum et al	do	131.40
	U. G. Purssell et al	do	131.40
	M. E. Blystone et al	do	240.90
	Jno. S. Hazzen et al	do	141.50
	E. C. Hobbs et al	do	131.40
	W. S. Currier et al	do	218.70
	T. B. Jennings et al	do	166.80
	W. S. Belden et al	do	264.50
	Geo. W. Felger et al	do	171.90
	Jno. R. Weeks et al	do	131.40
	L. G. Schultz et al	do	131.40
	I. M. Cline et al	do	266.10
	W. H. Fallon et al	do	131.10
	F. W. Conrad et al	do	131.40
	Saml. L. Dosher et al	do	184.70
	E. R. Demain et al	do	139.80
	E. J. Glass et al	do	240.90
	Robt. B. Harkness et al	do	131.40
	S. W. Glenn et al	do	240.90
	C. F. R. Wappenhaus et al	do	446.40
	Robt. G. Allen et al	do	267.50
	Alex. J. Mitchell et al	do	227.50
	W. U. Simons et al	do	139.80
	Weston M. Fulton et al	do	151.70
	Robt. H. Dean et al	do	131.40
	Charles F. Schneider et al	do	197.20
	Robt. Q. Grant et al	do	126.10
	Geo. A. Loveland et al	do	348.60
	E. B. Richards et al	do	412.80
	Geo. E. Franklin et al	do	230.60
	H. B. Hersey et al	do	448.10
	Geo. W. Wilson et al	do	131.40
	T. S. Collins et al	do	131.40
	H. R. Patrick et al	do	131.40
	Saml. C. Emery et al	do	240.90
	Lee A. Denson et al	do	131.40
	W. M. Wilson et al	do	528.90
	Thos. S. Outram et al	do	451.40
	Wm. M. Dudley et al	do	202.20
	Thos. P. Chaffee et al	do	328.60
	Geo. E. Grimes et al	do	114.50
	Henry C. Bate et al	do	438.00
	D. C. Grunow et al	do	144.80
	Edw. W. McGann et al	do	156.70
	L. M. Tarr et al	do	202.20
	W. T. Blythe et al	do	530.60
	Jas. J. Gray et al	do	224.00
	Chas. M. Strong et al	do	227.50
	L. A. Welsh et al	do	298.30
	J. G. Linsley et al	do	131.40
	E. C. Vose et al	do	268.00
	M. J. Wright, jr., et al	do	141.50
	Luther M. Dey et al	do	628.30
	S. S. Bassler et al	do	443.10
	James Kenealy et al	do	446.40
	J. W. Smith et al	do	402.30
	A. E. Hackett et al	do	247.20
	Jacob W. Bauer et al	do	156.70
	Geo. Reeder et al	do	126.53
	F. H. Brandenburg et al	do	367.20
	Geo. M. Chappel et al	do	409.30
	N. B. Conger et al	do	603.20
	E. H. Bowie et al	do	131.40
	H. W. Richardson et al	do	251.00
	Danl. C. Murphy et al	do	131.40
	Albert Ashenberger et al	do	121.64
	Thos. J. Considine et al	do	210.60
	Geo. B. Wurtz et al	do	126.10
	E. H. Nimmo et al	do	131.40
	A. F. Sims et al	do	227.50
	Fenton H. Duff et al	do	126.40
	Jno. B. Marbury et al	do	438.00
	David Fisher et al	do	131.40
	F. H. Clarke et al	do	141.10
	Byron H. Bronson et al	do	240.90
	S. M. Blandford et al	do	240.90
	J. W. Smith et al	do	570.60

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

WEATHER BUREAU—GENERAL EXPENSES—SALARIES—Continued.

Date.	Name.	Nature of payment.	Total.
1900.			
Dec. 31	David Cuthbertson et al	Salaries	$375.60
	Patrick H. Smyth et al	do	210.60
	Jas. H. Smith et al	do	180.30
	L. N. Jesunofsky et al	do	151.40
	Chas. Davis et al	do	141.10
	L. M. Pindell et al	do	224.00
	W. S. Palmer et al	do	240.90
	Total, second quarter		95,958.82
1901.			
Jan. 4	Jos. L. Cline	Services	61.96
	W. J. Duba	do	26.00
	W. E. Donaldson	do	101.10
	R. E. Glenn	do	6.00
	Chas. H. Whyte	do	10.00
	Oliver L. Fassig et al	Salaries	417.90
16	Chas. Gibbs	Services	28.00
	Robt. O. Cook, jr	do	.50
	C. W. Kennedy	do	7.00
17	Jno. R. Morton	do	2.45
18	Le Roi E. Stanton	do	14.00
	Jno. J. O'Donnell	do	62.50
25	R. E. Glenn	do	3.00
	Elmer Nickum	do	5.00
31	Geo. H. Eddey	do	103.30
	Jno. D. Blagden	do	86.10
	Balf D. Johnson	do	25.00
	Albert Brand	do	103.30
	W. C. McGuiness	do	86.10
	Benj. M. Jacobs	do	25.80
	W. L. Day	do	103.30
	C. P. Cronk	do	111.90
	Geo. L. Lovett	do	25.00
	Jno. W. Byram	do	103.30
	A. Drinkwater	do	43.10
	J. M. Sherier	do	111.90
	W. G. Myers	do	103.30
	J. P. Falliher	do	62.00
	N. D. Lane	do	103.30
	Aaron H. Bell	do	103.30
	Jos. P. Bolton	do	103.30
	O. D. Stewart	do	103.30
	R. L. Anderson	do	86.10
	Chas. W. Ling	do	86.10
	Jno. J. McLean	do	103.30
	Hal. P. Hardin	do	86.10
	Harvey B. Dick	do	86.10
	F. Z. Gossewisch	do	103.30
	Jos. J. Dosher	do	62.00
	Geo. W. Scott	do	103.30
	F. L. McClintic	do	86.10
	Wayland Bailey	do	86.10
	Jno R. Morton	do	25.80
	H. W. Grasse	do	86.10
	M. E. Conway	do	72.30
	Jos. C. Piercy	do	103.30
	Marsden Wright	do	72.30
	J. J. Kalliher	do	86.10
	Emma D. Sharpe	do	25.00
	Chas. Adie	do	72.30
	J. P. Slaughter	do	103.30
	W. D. Maxwell	do	103.30
	Maurice Connell	do	103.30
	Thos. Gibson	do	103.30
	Jas. A. Barwick	do	103.30
	Allen Buell	do	103.30
	Jno. R. Williams	do	103.30
	Jos. Sands	do	62.00
	Frank Beahan	do	103.30
	Fitzhugh Newman	do	103.30
	F. L. Johnson	do	103.30
	Ella W. Daniels	do	25.00
	Julius C. Hayden	do	86.10
	O. W. Roberts	do	103.30
	Sumner Hackett	do	41.30
	Geo. T. Todd	do	103.30
	Hugo Legler	do	72.30
	Eliz. L. Renoe	do	25.00
	Albert W. Kennie	do	25.00
	Wm. Bell et al	Salaries	134.30

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

WEATHER BUREAU—GENERAL EXPENSES—SALARIES—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
Jan. 31	Jno. S. Hazen et al	Salaries	$144.60
	M. E. Blystone et al	do	246.30
	Chas. Stewart et al	do	184.20
	Danl. P. McCallum et al	do	134.30
	Geo. N. Salisbury et al	do	201.50
	Harry P. Boyer et al	do	255.30
	R. M. Hardinge et al	do	215.30
	E. C. Thompson et al	do	134.30
	Ford A. Carpenter et al	do	134.30
	L. H. Murdock et al	do	335.80
	Robt. J. Hyatt et al	do	430.50
	Orin Parker et al	do	198.00
	E. A. Evans et al	do	396.10
	A. B. Wallaber et al	do	301.30
	C. F. von Herrmann et al	do	390.90
	Edw. P. Jones et al	do	246.30
	W. J. Olds et al	do	129.10
	Frank Ridgeway et al	do	330.60
	O. C. Burrows et al	do	117.10
	L. M. Dey et al	do	642.30
	Wm. G. Burns et al	do	246.30
	M. J. Wright, jr., et al	do	144.60
	Julius J. Linney et al	do	134.30
	L. A. Welsh et al	do	334.80
	Chas. M. Strong et al	do	232.50
	E. H. Emery et al	do	583.70
	Wm. T. Blythe et al	do	542.40
	Edw. M. McGann et al	do	160.20
	E. C. Hobbs et al	do	165.30
	Lee A. Denson et al	do	134.30
	Thos. S. Outram et al	do	461.50
	Frank P. Chaffee et al	do	335.80
	Geo. E. Guiness et al	do	117.10
	Henry C. Bate et al	do	447.70
	Saml. C. Emery et al	do	246.30
	H. R. Patrick et al	do	134.30
	T. S. Collins et al	do	134.30
	Geo. N. Wilson et al	do	134.30
	H. B. Hersey et al	do	458.00
	Geo. E. Franklin et al	do	235.30
	E. B. Richards et al	do	395.90
	Geo. A. Loveland et al	do	355.60
	Chas. F. Schneider et al	do	201.50
	W. M. Fulton et al	do	154.90
	Patk. Connor et al	do	332.40
	A. J. Mitchell et al	do	232.50
	Robt. G. Allen et al	do	272.50
	C. F. R. Wappenhaus et al	do	456.40
	T. W. Glenn et al	do	246.30
	R. B. Harkness et al	do	134.30
	E. J. Glass et al	do	246.30
	Saml. L. Dosher et al	do	137.80
	E. R. Demain et al	do	142.90
	Fredk. W. Conrad et al	do	134.30
	Louis G. Schultz et al	do	134.30
	E. H. Nimmo et al	do	134.30
	Thos. J. Considine et al	do	215.20
	Geo. B. Wurtz et al	do	128.30
	Danl. C. Murphy et al	do	134.30
	H. W. Richardson et al	do	256.60
	E. H. Bowie et al	do	134.30
	N. B. Conger et al	do	606.10
	Geo. M. Chappel et al	do	418.50
	F. H. Brandenburg et al	do	447.70
	Geo. Reeder et al	do	134.30
	J. W. Smith et al	do	410.70
	J. W. Bauer et al	do	160.20
	Arthur E. Hackett et al	do	251.50
	Jas. Kenealy et al	do	456.30
	S. S. Bassler et al	do	452.80
	Walter S. Palmer et al	do	246.30
	L. M. Pindell et al	do	229.00
	Chas. Davis et al	do	143.30
	L. N. Jesunofsky et al	do	154.20
	Jas. H. Smith et al	do	184.20
	P. H. Smyth et al	do	215.20
	David Cuthbertson et al	do	384.00
	J. W. Smith et al	do	559.17
	Saml. M. Blandford et al	do	246.30
	B. H. Bronson et al	do	246.30

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

WEATHER BUREAU—GENERAL EXPENSES—SALARIES—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
Jan. 31	O. L. Fassig et al	Salaries	$425.40
	Jno. B. Marbury et al	do	447.70
	Geo. H. Hagen et al	do	134.30
	Robt. Q. Grant et al	do	128.30
	F. H. Duff et al	do	129.10
	David Fisher et al	do	134.30
	Jno. R. Weeks et al	do	134.30
	I. M. Cline et al	do	375.40
	W. M. Wilson et al	do	540.70
	L. M. Tarr et al	do	206.60
	Jas. J. Gray et al	do	229.00
	Chas. E. Linney et al	do	600.40
	Wm. S. Currier et al	do	223.00
	T. B. Jennings et al	do	170.50
	W. S. Belden et al	do	270.30
	G. W. Felger et al	do	175.60
	A. F. Sims et al	do	232.50
	F. H. Clarke et al	do	143.30
	W. H. Fallon et al	do	133.30
	W. U. Simons et al	do	142.90
	Wm. M. Dudley et al	do	206.60
	Elisha C. Vose et al	do	273.80
	Patk. F. Lyons et al	do	301.40
	Robt. H. Dean et al	do	134.30
	Geo. H. Wilson et al	do	604.40
	Alex. G. Burns	Services	111.90
	W. E. Donaldson et al	Salaries	134.30
Feb. 1	Nathaniel Chapman	Services	10.00
	Louis Mennier	do	30.00
5	W. J. Duba	do	27.00
	Patk. McDonough	do	13.33
	Jno. G. Wood	do	27.00
	Calvin N. Hunn	do	9.00
	Geo. M. Wilmath	do	4.00
8	W. C. Cameron	do	30.00
	Chas. J. Nash	do	17.50
	Jas. M. Paris	do	18.00
11	F. Ray McMillan	do	28.00
	U. G. Purssell et al	Salaries	134.30
	Albert Ashenberger	Services	103.30
	W. A. Shaw	do	103.30
13	W. D. Gall	do	2.00
	Chas. Sherman	do	2.00
	Camden W. Kennedy	do	3.00
	Frank Bell	do	4.00
19	Frank C. Murphy	do	24.00
23	F. Ray McMillan	do	14.00
	James R. Haynes	do	3.00
	W. T. Blythe	do	19.00
28	Alex. G. Burns	do	101.20
	J. C. Hayden	do	77.80
	Ella W. Daniels	do	25.00
	F. L. Johnson	do	93.40
	Fitzhugh Newman	do	93.40
	Frank R. Beahan	do	93.40
	J. Sands	do	56.00
	Jno. R. Williams	do	93.40
	Ellen Buell	do	93.40
	Jas. A. Barwick	do	93.40
	Maurice Connell	do	93.40
	W. D. Maxwell	do	93.40
	J. P. Slaughter	do	93.40
	Waylan Bailey	do	77.80
	Chas. Adie	do	65.40
	Emma D. Sharpe	do	25.00
	J. J. Kelliher	do	77.80
	Patk. McDonough	do	93.40
	Jos. C. Piercy	do	93.40
	W. A. Shaw	do	93.40
	M. E. Conway	do	65.40
	Hugo Legler	do	65.40
	H. W. Grasse	do	77.80
	Jno. R. Morton	do	23.40
	Geo. W. Scott	do	93.40
	F. Z. Gossewisch	do	93.40
	H. B. Dick	do	77.80
	Hal. P. Hardin	do	77.80
	Jno. J. McLean	do	93.40
	Chas. W. Ling	do	77.80
	R. L. Anderson	do	77.80

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

WEATHER BUREAU—GENERAL EXPENSES—SALARIES—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
Feb. 28	A. H. Bell	Services	$93.40
	Albert Ashenberger	do	93.40
	U. G. Myers	do	93.40
	Geo. T. Todd	do	93.40
	J. M. Sherier	do	101.20
	A. Drinkwater	do	32.80
	Jno. W. Byram	do	93.40
	Geo. L. Lovett	do	25.00
	C. P. Cronk	do	101.20
	Benj. M. Jacobs	do	23.40
	F. J. Walz	do	373.26
	W. C. McGuiness	do	77.80
	Albert Brand	do	93.40
	B. D. Johnson	do	25.00
	Jno. D. Blagden	do	77.80
	Geo. W. Eddey	do	93.40
	Jos. P. Bolton	do	95.40
	A. W. Kennie	do	23.00
	Thos. Gibson	do	93.40
	Frank L. McClintic	do	77.80
	E. L. Renoe	do	25.00
	Sumner Hackett	do	37.40
	Willie J. Duba	do	24.00
	N. C. Jones	do	20.00
	Harold Frederick	do	20.00
	Louis Mennier	do	24.00
	O. W. Roberts	do	93.40
	H. C. O'Bleness	do	11.73
	O. D. Stewart	do	93.40
	N. D. Lane	do	93.40
	W. L. Day	do	93.40
	J. J. Dosher	do	56.00
	G. W. Felger et al	Salaries	158.80
	Chas. E. Linney et al	do	549.20
	Patrick Connor et al	do	300.20
	Everett C. Hobbs et al	do	149.40
	E. C. Thompson et al	do	121.40
	Jas. J. Gray et al	do	207.00
	L. M. Tarr et al	do	186.80
	Geo. C. Grimes et al	do	105.80
	W. M. Wilson et al	do	488.60
	F. H. Brandenburg et al	do	404.60
	David Fisher et al	do	121.40
	A. F. Sims et al	do	210.00
	Fenton H. Duff et al	do	116.80
	Jno. B. Marbury et al	do	404.60
	O. L. Fassig et al	do	389.20
	B. H. Bronson et al	do	222.40
	S. M. Blandford et al	do	222.40
	J. W. Smith et al	do	518.20
	David Cuthbertson et al	do	347.00
	P. H. Smith et al	do	194.60
	Jas. H. Smith et al	do	166.60
	Chas. Davis et al	do	133.40
	L. N. Jesunofsky et al	do	141.60
	L. M. Pindell et al	do	207.00
	W. S. Palmer et al	do	222.40
	Geo. Reeder et al	do	121.40
	S. S. Bassler et al	do	409.40
	Jas. Kenealy et al	do	412.40
	A. E. Hackett et al	do	232.00
	Jacob W. Bauer et al	do	144.60
	J. W. Smith et al	do	373.60
	Geo. M. Chappell et al	do	378.00
	N. B. Conger et al	do	547.80
	Edw. H. Bowie et al	do	121.40
	H. W. Richardson et al	do	231.80
	D. C. Murphy et al	do	115.40
	Thos. J. Considine et al	do	194.60
	Geo. B. Wurtz et al	do	118.40
	E. H. Nimmo et al	do	124.40
	Jno. R. Weeks et al	do	124.40
	Louis G. Schultz et al	do	124.40
	I. M. Cline et al	do	404.60
	W. H. Fallon et al	do	123.40
	F. W. Conrad et al	do	121.40
	E. R. Demain et al	do	129.40
	Sam L. Dosher et al	do	124.40
	Elvin J. Glass et al	do	222.40
	Robt. B. Harkness et al	do	121.40

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

WEATHER BUREAU—GENERAL EXPENSES—SALARIES—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
Feb. 28	S. W. Glenn et al	Salaries	$222.40
	Robt. G. Allen et al	do	184.60
	C. F. R. Wappenhaus et al	do	412.20
	Alex. J. Mitchell et al	do	210.00
	W. U. Simons et al	do	129.20
	W. M. Fulton et al	do	140.20
	Robt. H. Dean et al	do	121.40
	Chas. F. Schneider et al	do	182.00
	Robt. Q. Grant et al	do	118.40
	Geo. A. Loveland et al	do	323.80
	Edw. B. Richards et al	do	381.20
	Geo. E. Franklin et al	do	202.40
	Henry B. Hersey et al	do	414.00
	Geo. N. Wilson et al	do	121.40
	T. S. Collins et al	do	121.40
	H. R. Patrick et al	do	121.40
	Saml. C. Emery et al	do	222.40
	Lee A. Denson et al	do	124.00
	Thos. S. Outram et al	do	417.00
	Wm. M. Dudley et al	do	186.80
	Frank P. Chaffee et al	do	303.40
	Henry C. Bate et al	do	404.60
	Edw. W. McGann et al	do	144.60
	W. T. Blythe et al	do	462.20
	E. H. Emery et al	do	527.60
	Chas. M. Strong et al	do	210.00
	L. A. Welsh et al	do	303.40
	J. G. Lindsley et al	do	121.40
	E. C. Vose et al	do	182.00
	M. J. Wright, jr., et al	do	130.80
	Luther M. Dey et al	do	580.40
	Orville C. Burrows et al	do	105.80
	Frank Ridgway et al	do	326.80
	Wm. G. Burns et al	do	222.40
	Wm. J. Olds et al	do	116.80
	Edwd. P. Jones et al	do	222.40
	Arthur B. Wallaber et al	do	272.40
	Chas. F. von Herrmann et al	do	353.20
	Edwd. A. Evans et al	do	357.80
	Orin Parker et al	do	179.00
	Robt. J. Hyatt et al	do	389.00
	P. F. Lyons et al	do	272.20
	Ford A. Carpenter et al	do	121.40
	W. E. Donaldson et al	do	121.40
	Chas. Stewart et al	do	166.60
	Robt. M. Hardinge et al	do	194.40
	Geo. N. Salisbury et al	do	182.00
	U. G. Purssell et al	do	121.40
	D. P. McCallum et al	do	121.40
	L. H. Murdock et al	do	303.40
	M. E. Blystone et al	do	222.40
	Jno. S. Hazen et al	do	130.80
	Geo. H. Willson et al	do	546.20
	H. B. Boyer et al	do	234.40
	Wm. Bell et al	do	121.40
	E. G. Colvin et al	do	121.40
	W. S. Currier et al	do	204.00
	T. B. Jennings et al	do	154.00
	W. S. Beldin et al	do	244.40
Mar. 7	Fred H. Clarke et al	do	198.80
13	W. C. Cameron	Services	30.00
	Chas. J. Thornton	do	15.00
	C. W. Kennedy	do	24.00
	E. A. Valls	do	22.32
23	Wm. Weber	do	7.00
30	Eliz. L. Renoe	do	25.00
	Jno. J. Dosher	do	62.00
	Thos. C. Alford	do	12.00
	E. D. Beattie	do	120.00
	W. C. Cameron	do	19.00
	Geo. W. Eddey	do	103.30
	Jas. F. Atherton	do	86.10
	B. D. Johnson	do	25.00
	Albert Brand	do	103.30
	W. C. McGuiness	do	86.10
	Benj. M. Jacob	do	25.80
	W. L. Day	do	103.30
	Chas. E. Garrett	do	31.00
	C. P. Cronk	do	111.90
	Geo. L. Lovett	do	25.00

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

WEATHER BUREAU—GENERAL EXPENSES—SALARIES—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
Mar. 30	Ferd. J. Walz	Services	$155.00
	Jno. W. Byram	do	103.30
	A. Drinkwater	do	43.10
	Julius M. Sherier	do	111.90
	Geo. T. Todd	do	103.30
	U. A. Myers	do	103.30
	Joseph Sands	do	62.00
	N. D. Lane	do	103.30
	Aaron H. Bell	do	103.30
	Jos. P. Bolton	do	103.30
	M. L. Leffler	do	44.44
	O. D. Stewart	do	103.30
	Chas. W. Ling	do	86.10
	Robt. C. Anderson	do	86.10
	Sumner Hackett	do	41.30
	Orris W. Roberts	do	103.30
	J. C. Hayden	do	86.10
	Ella W. Daniels	do	25.00
	F. L. Johnson	do	103.30
	Fitzhugh Newman	do	103.30
	D. C. Grunow	do	77.77
	Jno. R. Williams	do	103.30
	Jas. A. Barwick	do	103.30
	Thos. Gibson	do	86.10
	Maurice Connell	do	103.30
	Wm. D. Maxwell	do	103.30
	J. P. Slaughter	do	103.30
	Chas. Adie	do	72.30
	Emma D. Sharpe	do	25.00
	J. J. Kelliher	do	86.10
	Patk. McDonough	do	103.30
	J. C. Piercy	do	103.30
	Wm. A. Shaw	do	103.30
	Frank R. Beahan	do	103.30
	M. C. Conway	do	72.30
	Hugo Legler	do	72.30
	H. W. Grasse	do	86.10
	Jno. R. Morton	do	25.80
	A. W. Kennie	do	25.00
	Frank L. McClinic	do	86.10
	Geo. W. Scott	do	103.30
	F. Z. Gossewisch	do	103.30
	H. B. Dick	do	86.10
	Hal. P. Hardin	do	86.10
	Jno. J. McLean	do	103.30
	Alex. G. Burns	do	111.90
	Robt. G. Allen et al	Salaries	272.50
	C. F. R. Wappenhaus et al	do	456.40
	S. W. Glenn et al	do	246.30
	Robt. B. Harkness et al	do	134.30
	E. J. Glass et al	do	246.30
	Sam L. Dosher et al	do	137.80
	E. R. Demain et al	do	142.90
	F. W. Conrad et al	do	134.30
	W. H. Fallon et al	do	133.30
	L. G. Schultz et al	do	134.30
	T. S. Collins et al	do	134.30
	E. H. Nimmo et al	do	134.30
	Dan. C. Murphy et al	do	134.30
	H. W. Richardson et al	do	256.60
	N. B. Conger et al	do	606.10
	Jacob W. Bauer et al	do	160.20
	A. E. Hackett et al	do	251.50
	E. W. McGann et al	do	160.20
	E. C. Hobbs et al	do	165.30
	Henry C. Bate et al	do	447.70
	Geo. E. Grimes et al	do	117.10
	Frank P. Chaffee et al	do	335.80
	Thos. S. Outram et al	do	461.50
	Lee A. Denson et al	do	134.30
	Henry R. Patrick et al	do	134.30
	Geo. N. Wilson et al	do	134.30
	Henry B. Hersey et al	do	458.00
	Geo. E. Franklin et al	do	246.30
	Edw. B. Richards et al	do	421.90
	Geo. J. Loveland et al	do	355.60
	Robt. H. Dean et al	do	134.30
	W. M. Fulton et al	do	154.90
	Chas. F. von Herrmann et al	do	390.90
	Arthur B. Wallaber et al	do	387.40

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

WEATHER BUREAU—GENERAL EXPENSES—SALARIES—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
Mar. 30	Frank Ridgway et al	Salaries	$361.60
	O. C. Burrows et al	do	117.10
	L. M. Dey et al	do	642.30
	Wm. G. Burns et al	do	246.30
	Marcus J. Wright et al	do	144.60
	Elisha C. Vose et al	do	273.80
	Julius G. Linsley et al	do	134.30
	Lucius A. Welsh et al	do	335.80
	Chas. M. Strong et al	do	232.50
	E. H. Emery et al	do	583.70
	Wm. Bell et al	do	134.30
	Jno. S. Hazen et al	do	144.60
	M. E. Blystone et al	do	246.30
	Chas. Stewart et al	do	184.20
	U. G. Purssell et al	do	134.30
	Dan. P. McCallum et al	do	134.30
	Geo. N. Salisbury et al	do	201.50
	Wm. E. Donaldson et al	do	134.30
	Robt. M. Hardinge et al	do	215.30
	Geo. H. Willson et al	do	604.40
	E. C. Thompson et al	do	134.30
	Ford. A. Carpenter et al	do	134.30
	Allen Buell et al	do	137.30
	L. H. Murdock et al	do	335.80
	Patk. F. Lyons et al	do	301.40
	Orin Parker et al	do	198.00
	Edw. A. Evans et al	do	396.10
	Saml. C. Emery et al	do	332.40
	Jno. R. Weeks et al	do	134.30
	Chas. F. Schneider et al	do	201.50
	Edw. P. Jones et al	do	215.30
	Chas. E. Linney et al	do	600.40
	Wm. S. Currier et al	do	223.00
	G. W. Felger et al	do	175.60
	David Fisher et al	do	134.30
	B. H. Bronson et al	do	246.30
	J. W. Smith et al	do	573.40
	Patrick H. Smyth et al	do	215.20
	J. Warren Smith et al	do	410.70
	Geo. Reeder et al	do	134.30
	F. H. Brandenburg et al	do	361.60
	Geo. M. Chappel et al	do	418.50
	E. G. Bowie et al	do	134.30
	Albert Ashenberger et al	do	134.30
	Thos. J. Considine et al	do	215.20
	Geo. B. Wurtz et al	do	128.30
	Isaac M. Cline et al	do	447.70
	Alex. J. Mitchell et al	do	232.50
	Patck. Connor et al	do	246.30
	W. U. Simons et al	do	142.90
	R. Q. Grant et al	do	128.30
	W. M. Wilson et al	do	540.70
	Wm. M. Dudley et al	do	206.60
	L. M. Tarr et al	do	206.60
	Wm. T. Blythe et al	do	536.40
	Jas. J. Gray et al	do	229.00
	Robt. J. Hyatt et al	do	461.50
	Harry B. Boyer et al	do	255.30
	Geo. H. Hagen et al	do	134.30
	T. B. Jennings et al	do	170.50
	W. S. Belden et al	do	270.30
	Jas. Kenealy et al	do	456.30
	S. S. Bassler et al	do	452.80
	W. S. Palmer et al	do	246.30
	L. S. Pindell et al	do	229.00
	Chas. Davis et al	do	143.30
	L. N. Jesunofsky et al	do	154.20
	Jas. H. Smith et al	do	184.20
	David Cuthbertson et al	do	384.00
	Saml. M. Blandford et al	do	215.30
	F. H. Clarke et al	do	143.30
	O. L. Fassig et al	do	425.40
	Jno. B. Marbury et al	do	447.70
	Fenton H. Duff et al	do	129.10
	A. F. Sims et al	do	232.50
	Total third quarter		97,341.83
Apr. 4	A. V. Groce	Services	54.40
	Chas. J. Thornton	do	15.00

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

WEATHER BUREAU—GENERAL EXPENSES—SALARIES—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
Apr. 4	Wm. J. Olds et al	Salaries	$129.10
13	Estate of J. Brown Hicklin	Services	58.33
19	R. A. J. Curtin	do	15.00
	Fredk. P. Holt	do	32.61
30	Ella W. Daniels	do	25.00
	F. L. Johnson	do	98.90
	Fitzhugh Newman	do	98.90
	D. C. Grunow	do	82.40
	J. A. Barwick	do	98.90
	Thos. Gibson	do	84.20
	Maurice Connell	do	98.90
	W. D. Maxwell	do	98.90
	J. P. Slaughter	do	98.90
	Chas. Adie	do	69.20
	Emma D. Sharpe	do	25.00
	J. J. Kelliher	do	82.40
	Pat'ck McDonough	do	98.90
	Jos. C. Piercy	do	98.90
	Wm. A. Shaw	do	98.90
	M. E. Conway	do	69.20
	Hugo Liegler	do	69.20
	H. W. Grasse	do	82.40
	A. W. Kennie	do	25.00
	F. E. Hartwell	do	41.21
	Frank L. McClintic	do	82.40
	Geo. W. Scott	do	98.90
	Jos. J. Dosher	do	59.30
	F. Z. Gossewisch	do	98.90
	H. B. Dick	do	82.40
	Hal P. Hardin	do	82.40
	Jno. J. McLean	do	98.90
	Chas. W. Ling	do	84.20
	Robt. L. Anderson	do	84.20
	Jos. P. Bolton	do	98.90
	Aaron H. Bell	do	98.90
	Jos. Sands	do	59.30
	U. G. Myers	do	98.90
	Julius M. Sherier	do	25.00
	Alpheus Drinkwater	do	41.20
	Jno. W. Byram	do	98.90
	Geo. L. Lovett	do	25.00
	C. P. Cronk	do	107.10
	Saml. C. Long	do	44.62
	W. L. Day	do	98.90
	Benj. M. Jacobs	do	24.70
	W. C. McGuiness	do	82.40
	Balf. G. Johnson	do	25.00
	Albert Brand	do	98.90
	Jas. F. Atherton	do	82.40
	Geo. W. Eddey	do	98.90
	Julius C. Hayden	do	82.40
	Jno. R. Williams	do	98.90
	Geo. T. Todd	do	98.90
	Nathan D. Lane	do	98.90
	O. D. Stewart	do	98.90
	Wm. P. Stewart	do	46.15
	Orris W. Roberts	do	98.90
	Richd. W. Gray	do	40.00
	Julius G. Linsley et al	Salaries	128.60
	Lucius A. Welsh et al	do	321.40
	Chas. M. Strong et al	do	222.50
	Jas. J. Gray et al	do	219.20
	Eben H. Emery et al	do	558.70
	Wm. T. Blythe et al	do	519.10
	L. M. Tarr et al	do	197.80
	E. W. McGann et al	do	153.30
	Frank R. Beaham et al	do	158.20
	Henry C. Bate et al	do	428.50
	Geo. E. Grimes et al	do	112.10
	Frank P. Chaffee et al	do	321.40
	Thos. S. Outram et al	do	441.70
	Robt. G. Allen et al	do	262.50
	C. F. R. Wappenhaus et al	do	436.80
	S. W. Glenn et al	do	235.70
	Robt. B. Harkness et al	do	128.60
	Saml. L. Dosher et al	do	131.90
	E. R. Demain et al	do	136.80
	Fredk. W. Conrad et al	do	128.60
	W. H. Fallon et al	do	128.90

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

WEATHER BUREAU—GENERAL EXPENSES—SALARIES—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
Apr. 30	I. M. Cline et al	Salaries	$428.50
	L. G. Schultz et al	do	128.60
	T. S. Collins et al	do	128.60
	E. H. Nimmo et al	do	128.60
	Geo. B. Wurtz et al	do	128.60
	Thos. J. Considine et al	do	206.00
	Albert Ashenberger et al	do	128.60
	Danl. C. Murphy et al	do	128.60
	Herbert W. Richardson et al	do	245.60
	Edwd. H. Bowie et al	do	138.50
	Geo. W. Felger et al	do	168.10
	W. M. Wilson et al	do	517.50
	Lee A. Denson et al	do	128.60
	Saml. C. Emery et al	do	318.10
	Jno. R. Weeks et al	do	128.60
	Geo. N. Wilson et al	do	138.50
	H. B. Hersey et al	do	438.40
	Geo. E. Franklin et al	do	235.70
	E. B. Richards et al	do	403.80
	Geo. A. Loveland et al	do	341.40
	Robt. Q. Grant et al	do	123.90
	Robt. H. Dean et al	do	128.60
	Weston M. Fulton et al	do	148.30
	W. U. Simons et al	do	136.80
	Patck. Connor et al	do	235.70
	Chas. E. Linney et al	do	725.80
	T. B. Jennings et al	do	163.20
	N. B. Conger et al	do	580.10
	Geo. M. Chappel et al	do	410.40
	F. H. Brandenburg et al	do	428.50
	Geo. Reeder et al	do	128.60
	J. W. Smith et al	do	369.20
	Jacob W. Bauer et al	do	153.30
	Arthur E. Hackett et al	do	242.80
	Jas. Kenealy et al	do	436.70
	S. S. Bassler et al	do	433.40
	Chas. F. Schneider et al	do	192.80
	Walter S. Palmer et al	do	235.70
	Lewis M. Pindell et al	do	197.41
	L. N. Jesunofsky et al	do	153.30
	Jas. H. Smith et al	do	176.30
	Patck. H. Smyth et al	do	206.00
	David Cuthbertson et al	do	367.50
	J. W. Smith et al	do	548.80
	Saml. M. Blandford et al	do	235.70
	Byron H. Bronson et al	do	235.70
	Wm. E. Donaldson et al	do	147.10
	O. L. Fassig et al	do	417.50
	David Fisher et al	do	138.50
	Jno. B. Marbury et al	do	438.40
	Fenton H. Duff et al	do	128.60
	Alfred F. Sims et al	do	232.40
	Elisha C. Vose et al	do	262.00
	M. J. Wright, jr., et al	do	138.50
	L. M. Dey et al	do	614.80
	O. C. Burrows et al	do	122.00
	Frank Ridgway et al	do	346.10
	W. J. Olds et al	do	128.60
	Edw. P. Jones et al	do	206.00
	C. J. Campbell	Services	27.69
	A. B. Wallaber et al	Salaries	370.80
	W. G. Burns et al	do	235.70
	Chas. F. Von Herrmann et al	do	374.10
	Edw. A. Evans et al	do	379.10
	Orin Parker et al	do	189.50
	Robt. J. Hyatt et al	do	441.70
	Patk. F. Lyons et al	do	288.40
	L. H. Murdock et al	do	321.40
	Allen Buell et al	do	128.60
	Ford A. Carpenter et al	do	128.60
	Geo. H. Willson et al	do	578.50
	R. M. Hardinge et al	do	206.00
	Alex. G. Burns et al	do	136.80
	H. B. Boyer et al	do	246.00
	Geo. N. Salisbury et al	do	291.70
	D. P. McCallum et al	do	128.60
	U. G. Purssell et al	do	136.80
	Chas. Stewart et al	do	176.30
	M. E. Blystone et al	do	235.70
	Jno. S. Hazen et al	do	138.50

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

WEATHER BUREAU—GENERAL EXPENSES—SALARIES—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
Apr. 30	E. C. Hobbs et al	Salaries	$128.60
	Geo. H. Hager et al	do	128.60
	W. S. Currier et al	do	219.20
	W. S. Beldon et al	do	258.70
	Henry R. Patrick et al	do	122.67
	E. J. Glass et al	do	219.88
	E. C. Thompson et al	do	128.60
	F. H. Clarke et al	do	151.93
	Chas. V. Richie	Services	27.69
	C. S. Leach	do	6.00
	Jno. C. Foster	do	15.00
	Jas. R. Haynes	do	6.92
	Eliz. L. Renoe	do	25.00
May 3	W. T. Blythe	do	4.84
	Alex. J. Mitchell et al	Salaries	217.92
	Wm. Dudley	Services	98.90
	Hermann E. Hobbs	do	69.20
9	Fred. J. Rothert	do	6.92
	Addison H. Snyder	do	7.50
10	Geo. B. Graves	do	96.00
21	J. P. Williams, jr	do	26.00
	J. P. Fallihee	do	40.00
	Jno. R. Morton	do	24.70
31	F. J. Walz et al	Salaries	748.40
	David Fisher et al	do	143.00
	Edw. B. Richards et al	do	417.40
	Wm. G. Burns et al	do	243.60
	Jno. R. Weeks et al	do	132.80
	Chas. F. Schneider et al	do	199.40
	L. M. Tarr et al	do	169.72
	Jas. J. Gray et al	do	226.60
	T. B Jennings et al	do	168.60
	E. C. Thompson et al	do	204.40
	Alfred F. Simms et al	do	240.20
	Fenton H. Duff et al	do	132.80
	Jno. B. Marbury et al	do	381.60
	O. L. Fassig et al	do	430.00
	W. E. Donaldson et al	do	150.80
	Byron H. Bronson et al	do	243.60
	Saml. M. Blandford et al	do	243.60
	J. W. Smith et al	do	567.40
	David Cuthbertson et al	do	380.00
	P. H. Smyth et al	do	213.00
	Jas. A. Smith et al	do	182.40
	L. N. Jesunofsky et al	do	158.40
	Lewis M. Lindell et al	do	196.00
	Walter S. Palmer et al	do	243.60
	S. S. Bassler et al	do	428.20
	Jas. Kenealy et al	do	451.60
	Arthur E. Hackett et al	do	249.40
	Jacob W. Bauer et al	do	158.40
	J. W. Smith et al	do	406.60
	Geo. Reeder et al	do	132.80
	F. H. Brandenburg et al	do	443.00
	Geo. M. Chappel et al	do	424.20
	N. B. Conger et al	do	374.80
	Edwd. H. Bowie et al	do	143.00
	H. W. Richardson et al	do	253.80
	Danl. C. Murphy et al	do	132.80
	Albert Ashenberger et al	do	132.80
	E. A. Evans et al	do	391.80
	Thos. J. Considine et al	do	213.00
	Geo. B. Wurtz et al	do	132.80
	E. H. Nimmo et al	do	132.80
	T. S. Collins et al	do	132.80
	L. G. Schultz et al	do	132.80
	I. M. Cline et al	do	514.60
	W. H. Fallon et al	do	132.20
	F. W. Conrad et al	do	132.80
	E. R. Demain et al	do	141.40
	Saml. L. Dosher et al	do	136.20
	Elvin J. Glass et al	do	213.00
	Robt. B. Harkness et al	do	132.80
	S. W. Glenn et al	do	243.60
	C. F. R. Wappenhaus et al	do	451.40
	Robt. G. Allen et al	do	270.00
	Alex. J. Mitchell et al	do	158.40
	Patrick Connor et al	do	243.60
	W. U. Simons et al	do	141.40
	Weston M. Fulton et al	do	153.40

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

WEATHER BUREAU—GENERAL EXPENSES—SALARIES—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
May 31	Robt. H. Dean et al	Salaries	$132.80
	Robt. Q. Grant et al	do	127.20
	Geo. A. Loveland et al	do	365.80
	Geo. E. Franklin et al	do	243.60
	Henry B. Hersey et al	do	453.20
	Geo. N. Wilson et al	do	143.00
	Henry R. Patrick et al	do	132.80
	Saml. C. Emery et al	do	328.80
	Lee A. Densen et al	do	132.80
	W. M. Wilson et al	do	535.00
	Thos. S. Outram et al	do	456.60
	W. M. Dudley et al	do	173.80
	Frank P. Chaffee et al	do	332.20
	Geo. E. Grimes at al	do	115.80
	Henry C. Bate et al	do	443.00
	Frank R. Beahan et al	do	163.60
	E. W. McGann et al	do	158.40
	Wm. T. Blythe et al	do	536.80
	Eben H. Emery et al	do	577.60
	L. A. Welsh et al	do	332.20
	Chas. M. Strong et al	do	230.00
	Julius G. Linsley et al	do	132.80
	Elisha C. Vose et al	do	271.00
	M. J. Wright, jr., et al	do	143.00
	Luther M. Dey et al	do	635.40
	O. C. Burrows et al	do	126.00
	Frank Ridgway et al	do	357.80
	Wm. J. Olds et al	do	132.80
	Edw. P. Jones et al	do	243.60
	A. B. Wallaber et al	do	383.40
	C. F. Von Herrmann et al	do	386.80
	Orin Parker et al	do	196.00
	Robt. J. Hyatt et al	do	456.60
	P. F. Lyons et al	do	298.20
	Lester H. Murdoch et al	do	332.20
	Allen Buell et al	do	132.80
	Fred A. Carpenter et al	do	132.80
	Geo. H. Willson et al	do	598.00
	Robt. M. Hardinge et al	do	213.00
	Alex. G. Burns et al	do	141.40
	Harry B. Boyer et al	do	253.00
	F. H. Clarke et al	do	183.40
	Geo. N. Salisbury et al	do	301.60
	Danl. P. McCallum et al	do	132.80
	N. G. Purssell et al	do	141.40
	M. E. Blystone et al	do	243.60
	Jno. S. Hazen et al	do	143.00
	Chas. Stewart et al	do	182.40
	Everett C. Hobbs et al	do	132.80
	Geo. H. Hagen et al	do	132.86
	Wm. S. Currier et al	do	243.60
	Wm. S. Beldin et al	do	267.60
	G. W. Felger	Services	173.80
	Chas. J. Thornton	do	15.00
	Jno. W. Crow	do	23.73
	Sumner Hackett	do	39.60
	J. C. Hayden	do	85.20
	Ella W. Daniels	do	25.00
	Dexter C. Grunow	do	85.20
	Jno. W. Crow	do	61.40
	J. J. Kelliher	do	85.20
	D. L. Crosby	do	27.69
	M. E. Conway	do	71.60
	Richd. W. Gray	do	40.00
	Joseph Sands	do	61.40
	N. D. Lane	do	102.20
	Eliz. L. Renoe	do	25.00
	Saml. C. Long	do	106.50
	Jno. C. Welsh	do	36.92
	Geo. W. Eddey	do	102.20
	Jas. F. Atherton	do	85.20
	Balfe D. Johnson	do	25.00
	Albert Brand	do	102.20
	W. C. McGuiness	do	85.20
	Benj. M. Jacobs	do	25.60
	Walcott L. Day	do	102.20
	Corydon P. Cronk	do	110.80
	Geo. L. Lovett	do	25.00
	John W. Byram	do	102.20
	Alpheus Drinkwater	do	42.60

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

WEATHER BUREAU—GENERAL EXPENSES—SALARIES—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
May 31	Julius M. Sherier	Services	$110.80
	Bemer S. Pague	do	153.40
	Geo. T. Todd	do	102.20
	U. G. Myers	do	102.20
	Aaron H. Bell	do	102.20
	Jos. P. Bolton	do	102.20
	Oscar D. Stewart	do	102.20
	Robt. L. Anderson	do	85.20
	Chas. W. Ling	do	85.20
	Jno. J. McLean	do	102.20
	Hal. P. Hardin	do	85.20
	Harvey B. Dick	do	85.20
	F. Z. Gosewisch	do	102.20
	Jos. J. Dosher	do	61.40
	Geo. W. Scott	do	102.20
	Frank L. McClintic	do	85.20
	Chas. V. Richey	do	40.80
	Albert W. Kennie	do	25.00
	Wm. P. Stewart	do	71.60
	Jno. R. Morton	do	25.60
	H. W. Grasse	do	85.20
	Hugo Legler	do	71.60
	Wm. A. Shaw	do	102.20
	Jos. C. Piercy	do	102.20
	Patrick McDonough	do	102.20
	Emma D. Sharpe	do	25.00
	Chas. Adie	do	71.60
	J. P. Slaughter	do	102.20
	W. D. Maxwell	do	102.20
	Thos. Gibson	do	85.20
	Jas. A. Barwick	do	102.20
	Jno. R. Williams	do	102.20
	Fitzhugh Newman	do	102.20
	F. L. Johnson	do	102.20
	Orris W. Roberts	do	102.20
	Sumner Hackett	do	40.80
June 4	M. Kean Maffitt	do	25.00
	A. E. Brown	do	26.00
12	Chas. Davis	do	85.71
	David Cuthbertson	Office expenses	10.00
	Jno. T. Neary	Services	2.97
	Carlton Jones	do	3.96
	C. S. Leach	do	30.00
15	Lucy N. Sands	do	118.00
	Maurice Connell	do	102.20
19	Herrmann E. Hobbs	do	60.00
	J. P. Williams, jr	do	27.00
20	Donald McLean	do	4.00
29	Norman M. Leonard	do	20.77
	G. W. McDowall	do	23.08
	Henry Jacke	do	28.00
	Henry A. Klaiber	do	20.00
	A. E. Brown	do	27.00
	Solomon Hyman	do	29.70
	R. M. Geddings	do	98.90
	Sumner Hackett	do	39.60
	Orris W. Roberts	do	98.90
	Julius C. Hayden	do	82.40
	Ella W. Daniels	do	25.00
	F. L. Johnson	do	98.90
	Fitzhugh Newman	do	98.90
	Dexter C. Grunow	do	82.40
	Jno. W. Crow	do	59.30
	Leon J. Guthrie	do	38.46
	Jno. R. Williams	do	98.90
	Edwin C. Thompson	do	9.89
	J. A. Barwick	do	98.90
	Thos. Gibson	do	82.40
	Maurice Connell	do	98.90
	Wm. D. Maxwell	do	98.90
	I. P. Slaughter	do	98.90
	Chas. Adie	do	69.20
	Grace H. Brown	do	24.70
	J. J. Kelliher	do	82.40
	Patrick McDonough	do	98.90
	Albert Brand	do	98.90
	Geo. T. Todd	do	98.90
	N. D. Lane	do	98.90
	Eliz. L. Renoe	do	25.00
	Geo. W. Eddey	do	98.90

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

WEATHER BUREAU—GENERAL EXPENSES—SALARIES—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
June 29	Jas. F. Atherton	Services	$82.40
	Balfe D. Johnson	do	25.00
	W. C. McGuiness	do	82.40
	Benj. M. Jacob	do	24.70
	Walcott L. Day	do	98.90
	G. Allen	do	49.45
	C. P. Cronk	do	107.10
	Geo. L. Lovett	do	25.00
	Jno. W. Byram	do	98.90
	Alpheus Drinkwater	do	41.20
	J. M. Sherier	do	107.10
	U. G. Myers	do	98.90
	Jas. Sands	do	59.30
	Aaron H. Bell	do	98.90
	Jos. P. Bolton	do	98.90
	Oscar D. Stewart	do	98.90
	Robt. L. Anderson	do	82.40
	Chas. W. Ling	do	82.40
	Jno. J. McLean	do	98.90
	Hal P. Hardin	do	82.40
	Harvey B. Dick	do	82.40
	F. Z. Gosewisch	do	98.90
	Jas. J. Dosher	do	59.30
	Frank L. McClintic	do	82.40
	Chas. W. Richey	do	39.60
	A. W. Kennie	do	25.00
	Jno. R. Morton	do	24.70
	H. W. Grasse	do	82.40
	Hugo Legler	do	69.20
	M. E. Conway	do	69.20
	Saml. L. Mosby	do	82.40
	Wm. A. Shaw	do	98.90
	Jos. C. Piercy	do	98.90
	F. W. Brist et al	Salaries	98.90
	Ford. A. Carpenter et al	do	128.60
	Allen Buell et al	do	128.60
	Lester H. Murdock et al	do	334.60
	Patrick F. Lyons et al	do	288.40
	Orin Parker et al	do	214.20
	Chas. F. von Herrmann et al	do	275.20
	Arthur B. Wallaber et al	do	370.80
	Wm. J. Olds et al	do	128.60
	Frank Ridgway et al	do	346.10
	O. C. Burrows et al	do	122.00
	Geo. N. Wilson et al	do	138.50
	Henry B. Hersey et al	do	438.40
	Geo. E. Franklin et al	do	252.20
	E. B. Richards et al	do	334.60
	Geo. A. Loveland et al	do	354.30
	Robt. Q. Grant et al	do	123.90
	Chas. F. Snyder et al	do	192.80
	Robt. H. Dean et al	do	128.60
	Weston M. Fulton et al	do	148.30
	W. U. Simons et al	do	136.80
	Patrick Connor et al	do	235.70
	T. F. Townsend et al	do	663.26
	Marcus J. Wright, jr., et al	do	138.50
	Elisha C. Vose et al	do	222.50
	Julius G. Linsley et al	do	128.60
	L. A. Welsh et al	do	321.40
	Chas. M. Strong et al	do	222.50
	Jas. J. Gray et al	do	219.20
	Eben H. Emery et al	do	476.30
	W. T. Blythe et al	do	558.33
	L. M. Tarr et al	do	197.80
	Edw. W. McGann et al	do	153.30
	Frank R. Beahan et al	do	158.20
	Geo. E. Grimes et al	do	112.10
	Frank P. Chaffee et al	do	321.40
	W. M. Dudley et al	do	197.80
	T. S. Outram et al	do	441.70
	W. M. Wilson et al	do	517.50
	Lee A. Denson et al	do	128.60
	Saml. C. Emery et al	do	318.10
	Henry R. Patrick et al	do	128.60
	G. W. Felger et al	do	168.10
	W. S. Beldin et al	do	258.70
	W. S. Currier et al	do	235.70
	Geo. H. Hagen et al	do	128.60
	E. C. Hobbs et al	do	128.60

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

WEATHER BUREAU—GENERAL EXPENSES—SALARIES—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
June 29	M. E. Blystone et al	Salaries	$235.70
	Jno. S. Hazen et al	do	138.50
	Chas. Stewart et al	do	176.30
	U. G. Purssell et al	do	136.80
	David P. McCallum et al	do	128.60
	Geo. N. Salisbury et al	do	291.70
	Fred A. Clarke et al	do	163.44
	Alex. G. Burns et al	do	136.80
	Robt. M. Harding et al	do	206.00
	Geo. H. Willson et al	do	578.50
	Edwd. A. Evans et al	do	379.10
	Geo. Reeder et al	do	128.60
	F. H. Brandenberg et al	do	401.77
	Geo. M. Chappell et al	do	410.40
	N. B. Conger et al	do	362.60
	E. H. Bowie et al	do	138.50
	H. W. Richardson et al	do	245.60
	Daniel C. Murphy et al	do	128.60
	S. S. Bassler et al	do	433.40
	Jas. Keneally et al	do	510.88
	Jacob W. Bauer et al	do	153.30
	A. E. Hackett et al	do	242.80
	J. W. Smith et al	do	449.58
	Jas. H. Smith et al	do	176.30
	L. N. Jesunofsky et al	do	208.68
	Geo. R. Oberholzer et al	do	138.90
	Lewis M. Pindell et al	do	219.20
	Walter S. Palmer et al	do	235.70
	Alfred F. Sims et al	do	232.40
	Fenton H. Duff et al	do	128.60
	Jno. R. Marbury et al	do	339.50
	O. L. Fassig et al	do	392.80
	W. E. Donaldson et al	do	147.10
	Byron H. Bronson et al	do	235.70
	Saml. H. Blandford et al	do	235.70
	J. W. Smith et al	do	548.80
	David Cuthbertson et al	do	558.25
	Patrick H. Smyth et al	do	206.00
	Wm. G. Burns et al	do	220.86
	Robert J. Hyatt et al	do	441.70
	Saml. L. Dosher et al	do	131.90
	Jno. R. Weeks et al	do	128.60
	Robt. G. Allen et al	do	225.17
	C. F. R. Wappenhaus et al	do	436.80
	S. W. Glenn et al	do	235.70
	Robt. B. Houghton et al	do	128.60
	E. J. Glass et al	do	206.00
	E. R. Demain et al	do	136.80
	Fredk. W. Conrad et al	do	128.60
	W. H. Fallon et al	do	128.90
	Isaac M. Cline et al	do	497.70
	L. G. Schultz et al	do	128.60
	T. S. Collins et al	do	128.60
	E. H. Nimmo et al	do	128.60
	Geo. B. Wurtz et al	do	128.60
	Thos. J. Considine et al	do	206.00
	Albert Ashenberger et al	do	128.60
	F. J. Waltz et al	do	725.80
	David Fisher et al	do	138.50
	T. B. Jennings et al	do	163.20
	Harry B. Boyer et al	do	246.00
	Edw. P. Jones et al	do	220.86
	Henry C. Bate et al	do	420.59
	Alex J. Mitchell et al	do	197.15
	Total fourth quarter		98,381.16
	Supplemental.		
July 3	Jas. L. Cline	Services	17.86
11	A. E. Brown	do	13.00
18	F. M. Nevins	do	6.00
	H. P. Brandenburg	do	15.00
	Jno. C. Foster	do	12.00
	Jos. R. Porter	do	6.00
	C. G. Bigham	do	9.23
	G. J. P. Barger	do	3.96
	Chas. H. Bridges	do	27.69
23	David Cuthbertson	do	25.00
	Earl L. Ovington	do	11.51

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

WEATHER BUREAU—GENERAL EXPENSES—SALARIES—Continued.

Date.	Name.	Nature of payment.	Total.
	Supplemental—Continued.		
1901.			
July 31	Harry C. Gropp	Services	$14.00
	Chas. L. Mooney	do	10.00
	Albert B. Pittman	do	8.00
Aug. 6	Geo. W. Scott	do	98.90
	Total		278.15

RECAPITULATION.

First quarter	$96,299.78
Second quarter	95,958.82
Third quarter	97,341.83
Fourth quarter	98,381.16
Supplemental	278.15
Total	388,259.74

METEOROLOGICAL OBSERVATION STATIONS.

Date.	Name.	Nature of payment.	Total.
1900.			
July 20	H. C. Frankenfield	Traveling expenses	$78.85
31	J. W. Towers	Services	70.80
	L. J. Guthrie	do	101.10
	Calvin A. Mueller	do	70.80
	O. C. Read	do	25.00
	Louis Dorman	do	101.10
	A. V. Randall	do	101.10
	Jos. Lopez	do	40.00
	G. Harold Noyes	do	101.10
	Richd. M. Geddings	do	126.40
	Chas. E. Ashcraft, jr	do	84.20
	Ernst T. Giers	do	101.10
	Jno. N. Ryker	do	3.26
	Paul De Graw	do	101.10
	Chas. H. Richardson	do	101.10
	F. G. Tingley	do	84.20
	Carmelo Sevilla	do	25.00
	H. G. McDonald	do	84.20
	Luis Ga y Carbonell	do	101.10
	M. W. Hayes	do	126.40
	Wm. B. Stockman	do	168.50
	H. McP. Baldwin	do	2.28
	Wm. T. Lathrope	do	70.80
	Frank Montgomery	do	70.80
	Harry O. Geren	do	70.80
	Frank W. Very	do	101.10
	R. A. Fesenden	do	252.70
	Jas. L. Bartlett	do	101.10
	Jas. H. Kimball	do	70.80
	Wm. J. A. Schoppe	do	70.80
	Patck. McDonough	do	109.50
	Wm. H. Alexander	do	101.10
	Wm. C. Devereaux	do	70.80
	Chas. F. Marvin	do	252.70
Aug. 31	do	do	252.70
	Jno. W. Towers	do	70.80
	Wm. C. Devereaux	do	70.80
	W. H. Alexander	do	101.10
	Patck. McDonough	do	109.50
	W. J. A. Schoppe	do	70.80
	Jas. H. Kimball	do	70.80
	J. L. Bartlett	do	101.10
	R. A. Fessenden	do	252.70
	Frank W. Very	do	101.10
	Harry O. Geren	do	70.80
	Frank Montgomery	do	70.80
	C. A. Mueller	do	70.80
	Wm. B. Stockman	do	168.50
	M. W. Hayes	do	126.40
	Luis Ga y Carbonell	do	101.10
	H. G. McDonald	do	84.20
	Fredk. P. Latimer	do	70.80
	Carmelo Sevilla	do	25.00

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

METEOROLOGICAL OBSERVATION STATIONS—Continued.

Date.	Name.	Nature of payment.	Total.
1900.			
Aug 31	Frank G. Tingley	Services	$84.20
	Chas. H. Richardson	do	101.10
	W. T. Lathrop	do	84.26
	Paul De Graw	do	101.10
	Chas. E. Ashcraft, jr	do	84.20
	R. M. Geddings	do	126.40
	G. Harrold Noyes	do	101.10
	Jas. Lopez	do	40.00
	A. E. Randall	do	101.10
	Louis Dorman	do	101.10
	O. C. Read	do	25.00
	Leon J. Guthrie	do	101.10
Sept. 15	Jno. C. Parker	Letter presses, etc	187.32
	Fredk. P. Latimer	Traveling expenses	14.65
	C. H. Richardson	Office expenses	12.60
	Ernst T. Giers	do	3.00
	Paul De Graw	do	10.50
	Trinidad Shipping and Trading Co., Ltd	Passenger transportation	55.00
	Pennsylvania R. R. Co	do	6.50
	Serafin Cruz	Painting bucket	2.00
	P. Fernandez y Ca	Printing crop bulletin	91.00
17	Ernst Giers	Services	101.10
18	Austin Smith	Blotting paper	184.00
	Jno. Underwood & Co	Ink	19.00
	The News Publishing Co	Printing crop bulletin	21.25
	Sociedad Anomina Luz Electrica	Electric lights	6.00
	Manuel G. Roves	Office rent, August	40.00
	Laureno Fuentez	do	30.00
	Manuel G. Roves	Office rent, July	40.00
	Teresa Joerg y Belot	Office rent, August	100.00
	do	Office rent, July	100.00
	Jose Nuza	Office rent, August	20.00
	do	Office rent, July	20.00
	Clyde Lemon	Services	2.72
	Wm. B. Stockman	Office expenses	13.84
	Wm. H. Alexander	do	11.38
	Wm. T. Lathrop	Traveling expenses	43.23
20	Standard Oil Co	Oil	5.94
	Paul De Graw	Office expenses	10.50
	Wm. B. Stockman	do	10.18
	Chas. H. Richardson	do	12.22
	J. H. Bunnell & Co	Relays, syringes, etc	95.03
	Cuban Submarine Telegraph Co	Telegraph services	9.65
30	Leon J. Guthrie	Services	97.80
	O. C. Read	do	25.00
	Louis Dorman	do	97.80
	Albert V. Randall	do	97.80
	Joseph Lopez	do	40.00
	G. H. Noyes	do	97.80
	Richd. M. Geddings	do	122.20
	Chas. E. Ashcraft, jr	do	81.60
	Paul De Graw	do	97.80
	Wm. T. Lathrop	do	74.68
	Chas. H. Richardson	do	97.80
	Franklin G. Tingley	do	81.60
	Camelo Sevilla	do	25.00
	Fredc. P. Lattimer	do	68.40
	Luis Gay Carbonell	do	97.80
	M. W. Hayes	do	122.20
	Wm. B. Stockman	do	163.00
	Ernst. T. Giers	do	83.15
	Calvin A. Mueller	do	68.40
	Frank Montgomery	do	68.40
	Harry O. Geren	do	68.40
	Frank W. Very	do	97.80
	R. A. Fessenden	do	244.60
	Jas. L. Bartlett	do	97.80
	Jas. H. Kimball	do	68.40
	Wm. J. A. Schoppe	do	68.40
	Patck. McDonough	do	106.00
	Wm. H. Alexander	do	97.80
	W. C. Devereaux	do	68.40
	Jno. W. Towers	do	68.40
	Chas. F. Marvin	do	244.60
	Howard G. McDonald	do	86.42
	Total first quarter		10,485.95
Oct. 1	The News Publishing Co	Printing reports	18.82
	P. Fernandez y Ca	do	78.00

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

METEOROLOGICAL OBSERVATION STATIONS—Continued.

Date.	Name.	Nature of payment.	Total.
1900.			
Oct. 1	Sociedad Anomina Luz Electrica	Electric lights	$6.20
	Jno. C. Parker	Letter presses	136.32
4	Jno. H. Bunnell & Co	Relays, etc	14.10
	Gulf, Colorado and Santa Fe Rwy. Co	Passenger transportation	19 26
	Wm. H. Alexander	Oil, etc	11.85
	The Trinidad Shipping and Trading Co	Passenger transportation	50.00
6	M. Du Perow	Bolts, etc	30.00
12	Jose Nuza	Rent	20.00
	Teresa Joerg y Belot	do	100.00
12	International Ocean Telegraph Co	Telegraph service	2.77
	The Cuba Submarine Telegraph Co	do	285.56
	Western Union Telegraph Co	do	39.65
16	Laureano Fuentes	Office rent	30.00
	D. O. Riviere	do	60.00
	Manuel G. Roves	do	40.00
	Jose Valenti	do	75.00
	D. Hoke Ross	do	72.00
18	E. Nuttall	do	109.50
	Jamaica Telephone Co. et al	Telephone service	23.25
	C. L. Haley & Co	Office rent	90.00
	Clinckett & Coates	do	88.00
	A. B. Smith	do	85.35
	W. B. Moses & Sons	Chairs, etc	24.35
25	Direct West India Cable Co., Limited	Telegraph service	39.77
	C. H. Richardson	Ice, etc	12.71
	Cuba Submarine Telegraph Co	Telegraph service	11.10
	P. McDonough	Postage stamps, etc	23.72
	Leon J. Guthrie	Postage	9.18
26	Paul De Grow	Ice, etc	11.50
	W. H. Alexander	do	11.40
	R. M. Geddings	do	7.72
	Louis Dorman	do	79.38
	Chas. E. Ashcraft	Cleaning office	19.27
	Sociedad Anomina Luz Electrica	Electric services	7.20
	The News Publishing Co	Printing bulletins	25.96
	Ed. Newman & Co	Ice, etc	10.56
	W. H. Johnson & Co	Ice	12.50
	Successors to J. B. Vicini	Office rent	120.00
30	Union Typewriter and Supplies Co	Ribbon support	.30
31	Chas. E. Marvin	Services	252.70
	Jno. W. Towers	do	70.80
	Wm. C. Devereaux	do	70.80
	Wm. H. Alexander	do	101.10
	Patk. McDonough	do	109.50
	Wm. J. A. Schoppe	do	70.80
	Jas. H. Kimball	do	70.80
	Jas. L. Bartlett	do	101.10
	R. A. Fessenden	do	252.70
	Frank W. Very	do	101.10
	Harry O. Geren	do	70.80
	Frank Montgomery	do	70.80
	Calvin A. Mueller	do	70.80
	Ernst T. Giers	do	84.20
	Wm. B. Stockman	do	168.50
	M. W. Hayes	do	99.90
	H. G. McDonald	do	101.10
	Luis Ga y Carbonell	do	101.10
	Fredk. P. Latimer	do	45.69
	Carmelo Sevilla	do	25.00
	F. G. Tingley	do	84.20
	Chas. H. Richardson	do	101.10
	Wm. T. Lathrop	do	84.20
	Paul De Graw	do	101.10
	Chas. E. Ashcraft, jr	do	84.20
	Richd. M. Geddings	do	126.40
	G. Harold Noyes	do	101.10
	Jos. Lopez	do	40.00
	A. V. Randall	do	101.10
	Louis Dorman	do	101.10
	O. C. Read	do	25.00
	L. J. Guthrie	do	101.10
	A. M. Curtin	do	42.50
Nov. 3	Wm. T. Lathrop	Office expenses	3.00
	Wm. B. Stockman	do	12.85
	Wm. C. Devereaux	Traveling expenses	9.80
8	Ernst T. Giers	do	33.63
	P. Fernandez y Ca	Printing bulletins	169.00
	Laureano Fuentes	Office rent	30.00
	Teresa Joerg y Belot	do	100.00
12	Jose Nuza	do	20.00

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

METEOROLOGICAL OBSERVATION STATIONS—Continued.

Date.	Name.	Nature of payment.	Total.
1900.			
Nov. 12	Manuel G. Roves	Office rent	$40.00
19	The French Telegraph Cable Co	Telegraph services	110.40
	do	do	196.75
	International Ocean Telegraph Co	do	2.17
	Cuba Submarine Telegraph Co	do	11.10
	Baltimore and Ohio R. R. Co	Passenger transportation	16.00
	Mittag & Volger	Carbon paper	54.00
22	W. B. Stockman	Traveling expenses	8.40
	R. M. Geddings	do	64.25
	The United States and Haiti Telegraph and Cable Co.	Telegraph services	278.39
	The French Telegraph and Cable Co	do	291.72
	Cuba Submarine Telegraph Co	do	247.97
23	Southern Rwy. Co	Passenger transportation	39.65
	Alabama Midland Rwy. Co	do	40.00
30	Chas. F. Marion	Services	244.60
	Jno. W. Towers	do	68.40
	W. H. Alexander	do	97.80
	Patck. McDonough	do	106.00
	W. J. A. Schoppe	do	68.40
	Jas. H. Kimball	do	68.40
	Jas. L. Bartlett	do	97.80
	Harry O. Geren	do	68.40
	Frank Montgomery	do	68.40
	C. A. Mueller	do	68.40
	Richd. M. Geddings	do	122.20
	Ernst T. Giers	do	81.60
	Wm. B. Stockman	do	163.00
	M. W. Hayes	do	122.20
	H. G. McDonald	do	97.80
	Luis Ga y Carbonell	do	97.80
	Carmelo Sevilla	do	25.00
	Franklin G. Tingley	do	81.60
	Chas. H. Richardson	do	97.80
	Wm. T. Lathrop	do	81.60
	Paul De Graw	do	97.80
	Reginald A. Fessenden	do	244.60
	Chas. E. Ashcraft, jr	do	81.60
	G. Harold Noyes	do	97.80
	Jos. Lopez	do	40.00
	A. V. Randall	do	97.80
	Louis Dorman	do	97.80
	O. C. Read	do	25.00
	L. J. Guthrie	do	97.80
	Wm. C. Deveraux	do	70.66
	Sociedad Anomina Luz Electrica	Electric lights	7.20
	Paul De Graw	Office expenses	10.50
	C. H. Richardson	do	12.02
Dec. 3	Southern Rwy. Co	Passenger transportation	14.15
	do	do	37.70
4	Jas. E. Ward & Co., Incorporated	do	45.00
	Wm. H. Alexander	Office expenses	11.17
	The News Publishing Co	Printing crop bulletins	18.73
	C. L. Haley & Co	Office rent	30.00
	Laureano Fuentes	do	30.00
10	M. G. Copeland & Co	Flags	667.00
11	Jose Nuza	Office rent	20.00
	Teresa Joerg y Belot	do	100.00
	M. W. Hayes	Office expenses	3.50
	do	do	12.08
14	Postal Telegraph Cable Co	Telegraph services	95.75
	J. Baumgarten & Sons	Rubber stamp	.61
	Manuel G. Roves	Office rent	40.00
	Western Union Telegraph Co	Telegraph services	101.84
18	Cuba Submarine Telegraph Co	do	12.25
	The United States and Haiti Telegraph and Cable Co.	do	126.87
	The French Telegraph Cable Co	do	256.34
	do	do	25.20
19	Sociedad Anomina Luz Electrica	Electric lights	7.20
	H. G. McDonald	Office expenses	10.10
	Chas. H. Richardson	do	12.18
20	A. E. Outerbridge & Co	Passenger transportation	63.00
31	Richd. M. Geddings	Services	81.52
	Chas. F. Marvin	do	252.70
	Jno. W. Towers	do	70.80
	Wm. H. Alexander	do	101.10
	Wm. J. A. Schoppe	do	70.80
	Jas. W. Kimball	do	70.80
	Jas. L. Bartlett	do	101.10

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

METEOROLOGICAL OBSERVATION STATIONS—Continued.

Date.	Name.	Nature of payment.	Total.
1900.			
Dec. 31	R. A. Fessenden	Services	$252.70
	Harry O. Geren	do	70.80
	Frank Montgomery	do	70.80
	C. A. Mueller	do	70.80
	Ernst T. Giers	do	84.20
	Wm. B. Stockman	do	168.50
	M. W. Hayes	do	126.40
	H. G. McDonald	do	101.10
	Luis Ga y Carbonell	do	101.10
	Wm. C. Devereaux	do	84.20
	Carmelo Sevilla	do	25.00
	F. G. Tingley	do	84.20
	Chas. H. Richardson	do	101.10
	W. T. Lathrop	do	84.20
	Paul De Graw	do	101.10
	G. Harold Noyes	do	101.10
	Jas. Lopez	do	40.00
	Albert V. Randall	do	101.10
	Louis Dorman	do	101.10
	O. C. Read	do	25.00
	L. J. Guthrie	do	101.10
	Total second quarter		14,215.59
1901.			
Jan. 3	United States Express Co	Transportation	1.77
	Southern Rwy. Co	Passenger transportation	32.15
	do	do	16.45
4	Jos. L. Cline	Services	48.91
	P. Fernandez y Ca	Printing crop report, etc	79.50
5	Paul De Graw	Office expenses	10.50
	Jose Valenti	Office rent	75.00
	A. E. Outerbridge & Co	Passenger transportation	51.00
	Boulton, Bliss & Dallett	do	50.00
7	Laureano Fuentes	Office rent	30.00
	Successor to J. B. Vicini	do	120.00
	C. L. Halley & Co	do	30.00
	Wm. H. Alexander	Office expenses	10.64
11	A. J. Henry	Traveling expenses	85.75
	do	Office expenses	32.42
16	D. Hope Ross	Office rent	72.00
	Chas. E. Ashcraft, jr	Services	93.47
	Cuba Submarine Telegraph Co	Telegraph services	21.10
	Julien P. Friez	Rain gauges	142.00
	Teresa Joerg y Belot	Office rent	100.00
	Jose Nuza	do	20.00
	S. H. A. Greet	Services	8.87
17	The News Publishing Co	Printing crop bulletins, etc	20.00
	Texas and New Orleans R. R. Co	Passenger transportation	12.35
18	The News Publishing Co	Printing crop report, etc	17.23
	O. C. Read	Office expenses	10.00
	Manuel G. Roves	Office rent	40.00
	Jno. J. O'Donnell	Services	26.09
21	E. Nuttall	Office rent	109.50
	A. B. Smith	do	85.35
	Leon J. Guthrie	Office expenses	9.39
	M. W. Hayes	do	12.83
	Wm. H. Alexander	do	13.36
	Louis Dorman	do	64.93
	J. L. Cline	Traveling expenses	50.15
	Cuba and Pan-American Express Co	Transportation	24.74
	Jamaica Telephone Co., Limited	Telephone rent	23.25
23	J. L. Bartlett	Traveling expenses	6.20
25	C. H. Richardson	Office expenses	12.32
	Jose M. Castillo	Ice	9.00
31	Chas. F. Marvin	Services	258.30
	Jno. W. Towers	do	72.30
	Wm. H. Alexander	do	103.30
	Jno. J. O'Donnell	do	103.30
	W. J. A. Schoppe	do	72.30
	J. H. Kimball	do	72.30
	Jas. L. Bartlett	do	103.30
	R. A. Fessenden	do	258.30
	H. O. Geren	do	72.30
	Frank Montgomery	do	72.30
	Calvin A. Mueller	do	72.30
	Ernst T. Giers	do	86.10
	S. H. Austin Greet	do	25.00
	W. B. Heckman	do	172.20
	M. W. Hayes	do	129.20
	H. G. McDonald	do	103.30

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

METEOROLOGICAL OBSERVATION STATIONS—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
Jan. 31	Luis Ga y Carbonell	Services	$103.30
	Wm. C. Devereaux	do	86.10
	Carmelo Sevilla	do	25.00
	Franklin G. Tingley	do	86.10
	C. H. Richardson	do	103.30
	Wm. T. Lathrop	do	86.10
	Paul De Graw	do	103.30
	Chas. E. Ashcraft, jr	do	103.30
	Jos. L. Cline	do	129.20
	G. H. Noyes	do	103.30
	Jose Lopez	do	40.00
	A. V. Randall	do	103.30
	Louis Dorman	do	103.30
	O. C. Read	do	25.00
	L. J. Guthrie	do	103.30
	Patck. McDonough	do	109.50
Feb. 1	Pennsylvania R. R. Co	Passenger transportation	6.50
	Henry J. Green	Thermometers	325.00
	Ed. Newman & Co	Oil, ice, etc	8.08
	The French Telegraph-Cable Co	Telegraph services	25.60
	do	do	135.79
	International Ocean Telegraph Co	do	12.65
	United States and Haiti Telegraph and Cable Co.	do	132.64
	Clinckett & Coates	Office rent	88.00
	D. D. Riviere	do	60.00
4	P. McDonough	Office expenses	12.48
	Cuba Submarine Telegraph Co	Telegraph services	123.50
	The International Ocean Telegraph Co	do	5.41
	Pennsylvania R. R. Co	Passenger transportation	13.00
	A. E. Outerbridge & Co	do	60.00
	Sociedad Anomina Luz Electrica	Electric lights	7.20
	P. Fernandez y Ca	Printing climate and crop bulletins.	52.00
	C. L. Haley & Co	Office rent	30.00
5	Patck. McDonough	Services	97.50
8	P. Fernandez y Ca	Printing climate and crop bulletins.	117.00
	Jose Nuza	Office rent	20.00
	Manuel G. Roves	do	40.00
	Teresa Joerg y Belot	do	100.00
	West India and Panama Telegraph Co., Limited.	Telegraph services	1,798.02
	The French Telegraph-Cable Co	do	112.25
	Cuba Submarine Telegraph Co., Limited	do	10.80
9	W. T. Lathrop	Office expenses	2.00
	Paul De Graw	do	15.00
	Postal Telegraph-Cable Co	Telegraph services	28.48
	Western Union Telegraph Co	do	63.82
	Cuba Submarine Telegraph Co	do	358.09
	Jno. C. Parker	Letter scale	3.00
	Eberhard Faber	Rubber bands	676.00
13	A. Testart	Office expenses	3.93
	Sociedad Anomina Luz Electrica	Installation of electric light	12.00
18	R. P. Clarke Co	Supplies	164.20
	Postal Telegraph-Cable Co	Telegraph services	31.36
	Wyckoff, Seamans & Benedict	Paper	27.90
	United States Express Co	Transportation	5.71
	do	do	.92
19	Jno. W. Stonebraker	Paper	64.75
	M. W. Hayes	Office expenses	10.24
	J. J. O'Donnell	Traveling expenses	28.19
20	Morris European and American Express Co.	Transportation	21.54
	do	do	14.36
23	Southern Rwy. Co	Passenger transportation	37.50
	The Cuban Submarine Telegraph Co	Telegraph service	6.40
	Postal Telegraph-Cable Co	do	83.99
	A. V. Randall	Office expenses	20.25
	C. H. Richardson	do	11.65
	Wm. H. Alexander	do	11.18
	P. McDonough	Traveling expenses	26.84
	C. L. Haley & Co	Office rent	30.00
25	Baltimore and Ohio R. R. Co	Transportation	1.40
	Wm. H. Alexander	Services	93.40
	Jno. J. O'Donnell	do	93.40
	W. J. A. Schoppe	do	65.40
	Jas. H. Kimball	do	65.40
	Jas. L. Bartlett	do	93.40
28	Harry O. Geren	do	65.40

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

METEOROLOGICAL OBSERVATION STATIONS—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
Feb. 28	Frank Montgomery	Services	$65.40
	Calvin A. Mueller	do	65.40
	S. H. A. Greet	do	25.00
	W. B. Stockman	do	155.60
	M. W. Hayes	do	116.60
	Luis Ga y Carbonell	do	93.40
	Wm. C. Devereaux	do	77.80
	H. G. McDonald	do	93.40
	Carmelo Sevilla	do	25.00
	F. G. Tingley	do	77.80
	C. H. Richardson	do	93.40
	R. A. Fessenden	do	233.40
	Wm. T. Lathrop	do	77.80
	Paul De Graw	do	93.40
	Chas. E. Ashcraft, jr	do	93.40
	Jos. L. Cline	do	116.60
	G. H. Noyes	do	93.40
	Jos. Lopez	do	40.00
	A. V. Randall	do	93.40
	Louis Dorman	do	93.40
	Leon J. Guthrie	do	93.40
	Chas. F. Marvin	do	233.40
	Jno. W. Towers	do	65.40
	Ernst T. Giers	do	77.80
Mar. 5	The Cuba Submarine Telegraph Co	Telegraph service	9.70
6	Jno. C. Parker	Paper, etc	396.64
	Postal Telegraph-Cable Co	Telegraph service	129.05
7	A. V. Randall	Expenses	18.25
	Laureano Fuentes	Office rent	30.00
	do	do	30.00
	Pennsylvania R. R. Co	Passenger transportation	6.50
	Central R. R. Co. of New Jersey	do	6.50
	Paul De Graw	Office expenses	10.50
12	United States Express Co	Transportation	3.15
13	Manuel G. Roves	Office rent	40.00
	M. W. Hayes	Office expenses	20.65
	Jose Nuza	Office rent	20.00
	Teresa Joerg y Belot	do	100.00
	Jno. T. West	Printing report	25.00
14	O. C. Read	Services	25.00
	G. H. Noyes	Office expenses	11.06
	Department of the interior of Porto Rico	Office rent	66.61
	do	do	261.13
19	P. Fernandez y Ca	Printing bulletins	78.00
	Chas. E. Ashcraftj, r	Office expenses	25.78
20	W. T. Lathrop	do	3.00
	C. H. Richardson	do	11.21
	The West India and Panama Telegraph Co	Telegraph service	2.10
	G. H. Noyes	Office expenses	42.00
22	J. Edw. Turton	File cases	36.00
	Morris European and American Express Co.	Transportation	6.50
	do	do	38.95
	do	do	5.86
	Morris European and American Express Co.	do	7.38
	Pennsylvania R. R. Co	do	.75
	do	do	2.94
	do	do	.35
23	Paul De Graw	Office expenses	10.50
	Wm. H. Alexander	do	10.85
	Croney & Co	Office rent	30.00
	United States Envelope Co	Envelopes	613.62
28	Morris European and American Express Co.	Transportation	23.06
	Pennsylvania R. R. Co	do	.57
30	Chas F. Marvin	Services	258.30
	Jno. W. Towers	do	72.30
	Wm. H. Alexander	do	103.30
	Jno. J. O'Donnell	do	103.30
	Wm. J. A. Schoppe	do	72.30
	Jas. H. Kimball	do	72.30
	Jas. L. Bartlett	do	103.30
	Harry O. Geren	do	72.30
	Frank Montgomery	do	72.30
	Calvin A. Mueller	do	72.30
	S. H. A. Greet	do	25.00
	Wm. B. Stockman	do	172.20
	M. W. Hayes	do	129.20
	H. G. Montgomery	do	103.30

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

METEOROLOGICAL OBSERVATION STATIONS—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
Mar. 30	Luis Ga y Carbonell	Services	$103.30
	Wm. C. Devereaux	do	86.10
	Carmelo Sevilla	do	25.00
	Franklin G. Tingley	do	86.10
	Chas. H. Richardson	do	103.30
	R. A. Fessenden	do	258.30
	Wm. T. Lathrop	do	86.10
	Paul De Graw	do	103.30
	Chas. E. Ashcraft, jr	do	103.30
	Josephine L. Cline	do	129.20
	G. H. Noyes	do	103.30
	Joseph Lopez	do	40.00
	Albert V. Randall	do	103.30
	Louis Dorman	do	103.30
	O. C. Read	do	25.00
	L. J. Guthrie	do	103.30
	Danl. J. Herndon	do	93.30
	Total third quarter		17,993.20
Apr. 2	Western Union Telegraph Co	Service	9.15
	The Cuba Submarine Telegraph Co	do	9.73
	Jose Valenti	Office rent	75.00
	D. Hope Ross	do	72.00
6	Postal Telegraph Cable Co	Service	96.28
10	Cuba Submarine Telegraph Co	do	.35
11	P. Fernandez y Ca	Printing crop summary	35.00
	Laureano Fuentes	Office rent	30.00
17	Jose Nuza	do	20.00
	Teresa Jeorg y Belot	do	100.00
	A. B. Smith	do	85.35
	Department of the interior of Porto Rico	do	138.71
	E. Nuttall	do	109.50
	Manuel G. Roves	do	40.00
	P. Fernandez y Ca	Printing bulletins	78.00
	Natalio Ruiz	Painting	12.00
	Sociedad Anomina Luz Electrica	Electric light	21.60
	The Southern Kansas Rwy. Co	Passenger transportation	46.10
18	The Friedenwald Co	Duplicating paper	280.00
	News Publishing Co	Printing reports	54.49
	Jamaica Telegraph Co., Limited	Rent	23.25
19	M. W. Hayes	Office expenses	12.24
	The Friedenwald Co	Paper wrappers	403.20
24	H. G. McDonald	Services	6.59
	Louis Dorman	Office expenses	63.93
	C. H. Richardson	do	11.86
	Leon J. Guthrie	do	9.81
26	Ed Newman & Co	Ice and oil	10.36
	Clenckett & Coates	Rent of office	88.00
	Paul De Graw	Expenses of office	10.50
27	New York and Cuba Mail S. S. Co	Passenger transportation	45.00
	D. O. Riviere	Office rent	60.00
	Cuba Submarine Telegraph Co	Service	2.40
30	G. H. Noyes	Services	98.90
	L. J. Guthrie	do	98.90
	Joseph L. Cline	do	123.60
	Carmelo Sevilla	do	15.82
	Danl. J. Herndon	do	85.71
	Chas. F. Marvin	do	247.25
	Jno. W. Towers	do	69.20
	Wm. H. Alexander	do	98.90
	Jno. J. O'Donnell	do	98.90
	Wm. J. A. Schoppe	do	69.20
	Jas. A. Kimball	do	69.20
	Jas. L. Bartlett	do	98.90
	Harry O. Geren	do	69.20
	Frank Montgomery	do	69 20
	Calvin A. Mueller	do	69.20
	S. H. A. Greet	do	25.00
	Wm. B. Stockman	do	164.80
	M. W. Hayes	do	123.60
	Luis Ga y Carbonell	do	98.90
	Wm. C. Devereaux	do	82.40
	Franklin G. Tingley	do	82.40
	Chas. H. Richardson	do	98.90
	R. A. Fessenden	do	247.25
	W. T. Lathrop	do	82.40
	Paul De Graw	do	98.90
	Chas. E. Ashcraft, jr	do	98.90
	Louis Dorman	do	98.90

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

METEOROLOGICAL OBSERVATION STATIONS—Continued.

Date.	Name.	Nature of payment.	Total.
1901.			
Apr. 30	Jos. Lopez	Services	$40.00
	A. V. Randall	do	98.90
	O. C. Read	do	25.00
May 2	Wm. T. Lathrop	Office expenses	3.24
3	Hoke Engraving Plate Co	Recoating plates	3.50
	Wm. H. Alexander	Office expenses	12.22
	I. P. Roosa	do	15.22
	Chas. E. Ashcraft, jr	do	25.68
	Wm. B. Stockman	Traveling expenses	8.65
	Croney & Co	Rent of office	30.00
	Laureano Fuentes	do	30.00
6	Successors to J. B. Vicini	do	120.00
	Western Union Telegraph Co	Services	7.60
10	A. V. Randall	Office expenses	20.25
	do	do	2.00
	J. L. Cline	Traveling expenses	22.15
11	P. Fernandez y Ca	Printing bulletins	91.00
	Jose Nuza	Office rent	20.00
	Teresa Jeorg y Belot	do	100.00
13	United States Express Co	Transportation	.72
	do	do	.31
21	Western Union Telegraph Co	Service	7.98
	Manuel G. Roves	Rent of office	40.00
	Benito Castellanos	Services	10.83
11	Jos. L. Cline	Office expenses	13.45
23	Postal Telegraph Cable Co	Service	117.34
29	Morris European and American Express Co., Ltd.	Transportation	19.76
	do	do	4.40
	do	do	9.57
	Pennsylvania R. R. Co	do	.99
	do	do	1.81
	do	do	1.72
	do	do	.35
	do	do	.51
	do	do	.56
	do	do	2.62
	do	do	.35
31	A. E. Outerbridge	Passenger transportation	63.00
	Boulton, Bliss & Dallett	do	70.00
	The French Telegraph Cable Co	Service	6.60
	C. H. Richardson	Office expenses	11.81
	Paul De Graw	do	10.50
	T. Frederick Davis	Traveling expenses	13.15
	Croney & Co	Rent of office	30.00
	Leon J. Guthrie	Services	102.20
	C. F. Marvin	do	255.50
	Jno. W. Towers	do	71.60
	Wm. H. Alexander	do	102.20
	Jno. J. O'Donnell	do	102.20
	Louis Dorman	do	255.50
	W. J. A. Schoppe	do	71.60
	Jas. A. Kimball	do	71.60
	M. W. Hayes	do	127.80
	J. L. Bartlett	do	102.20
	Harry O. Geren	do	71.60
	Frank Montgomery	do	71.60
	Calvin A. Mueller	do	71.60
	S. H. A. Greet	do	25.00
	Wm. B. Stockman	do	170.40
	W. C. Devereaux	do	85.20
	F. G. Tingley	do	85.20
	Dan. J. Herndon	do	102.20
	Chas. H. Richardson	do	102.20
	R. A. Fessenden	do	255.50
	Wm. T. Lathrop	do	85.20
	Paul De Graw	do	102.20
	Chas. E. Ashcraft, jr	do	102.20
	Jos. L. Cline	do	127.80
	G. Harold Noyes	do	102.20
	Jas. Lopez	do	40.00
	A. V. Randall	do	102.20
	O. C. Read	do	25.00
	T. Fred. Davis	do	90.69
June 4	Wm. H. Alexander	do	10.35
11	M. G. Copeland & Co	Flags	178.50
	do	do	107.25
	Rudolph, West & Co	Waste cotton	13.40
	D. Frank Parker	Typewriter ribbons	18.00
12	Laureano Fuentes	Office rent	30.00

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

METEOROLOGICAL OBSERVATION STATIONS—Continued.

Date.	Name.	Nature of payment.	Total.
1900.			
June 12	Benito Castellanos	Services	$25.00
	Wm. B. Stockman	Office expenses	10.48
	Louis Dorman	Traveling expenses	80.40
	Austin Smith	Blotting paper	27.60
	The Cuba Submarine Telegraph Co	Service	52.80
	do	do	3.95
15	P. Fernandes y Co	Printing crop reports	78.00
	Teresa Joerg y Belot	Office rent	100.00
	Ed. C. Finlay	Services	85.00
19	Pennsylvania R. R. Co	Transportation	1.01
	do	do	.41
	Boulton, Bliss & Dallett	Passenger transportation	70.00
	New York and Cuban Mail S. S. Co	do	45.00
	Pennsylvania R. R. Co	do	14.50
	Louisville & Nashville R. R. Co	do	32.00
	Savannah, Florida and Western Ry. Co	do	29.15
	Herman E. Hobbs	Traveling expenses	24.32
	J. L. Cline	do	26.63
	Carter, Rice & Co. (Corporation)	Book paper	80.00
	Manuel G. Roves	Rent	40.00
20	C. H. Richardson	Office expenses	11.95
	Wm. H. Alexander	Traveling expenses	32.55
	Postal Telegraph Cable Co	Service	107.80
	Western Union Telegraph Co	do	11.77
	Rudolph, West & Co	Waste cotton	40.20
29	Henry O. Geren	Services	74.51
	Wm. T. Lathrop	Office expenses	3.00
	Paul De Graw	do	10.50
	Wm. B. Stockman	do	11.24
	J. J. O'Donnell	do	23.74
	M. W. Hayes	Traveling expenses	8.50
	L. J. Guthrie	Services	52.75
	O. C. Read	do	25.00
	Louis Dorman	do	98.90
	A. V. Randall	do	98.90
	Jos. Lopez	do	40.00
	W. H. Alexander	do	98.90
	G. H. Noyes	do	98.90
	E. C. Thompson	do	111.26
	C. E. Ashcraft, jr	do	98.90
	Paul De Graw	do	98.90
	Wm. T. Lathrop	do	82.40
	Jas. H. Kimball	do	69.20
	R. A. Fessenden	do	247.25
	A. R. Teeple	do	69.20
	C. H. Richardson	do	98.90
	Daniel J. Hernden	do	98.90
	Frank G. Tingley	do	82.40
	Benito Castellanos	do	29.70
	Edwd. C. Findlay	do	82.40
	W. C. Devereaux	do	82.40
	Jas. L. Bartlett	do	98.90
	M. W. Hayes	do	123.60
	Wm. B. Stockman	do	164.80
	S. H. A. Greet	do	25.00
	C. A. Mueller	do	69.20
	Frank Montgomery	do	69.20
	W. J. A. Schoppe	do	69.20
	Jno. J. O'Donnell	do	98.90
	H. E. Hobbs	do	96.14
	Jno. W. Towers	do	69.20
	Chas. F. Marvin	do	247.25
	T. F. Davis	do	82.40
	Total, fourth quarter		18,284.12
	Supplemental.		
July 1	Jno. C. Parker	Book paper	176.00
2	Croney & Co	Office rent	30.00
	José Valenti	do	75.00
	D. Hope Ross	do	72.00
	Martin B. Stubbs	Traveling expenses	2.45
	Compagnie Générale Transatlantique	Passenger transportation	10.00
	A. O. Abrahams	Repairing clocks	4.00
3	J. L. Cline	Services	103.02
	do	Office expenses	11.55
	Jas. L. Bartlett	Traveling expenses	63.10
5	Martin B. Stubbs	Services	69.20
6	M. Du Perow	Gordon battery, recharge	51.00

Expenditures of Department of Agriculture for year ending June 30, 1901—Cont'd.

METEOROLOGICAL OBSERVATION STATIONS—Continued.

Date.	Name.	Nature of payment.	Total.
1900.			
July 9	Morris E. A. Express Co	Transportation	$13.39
11	Hermann E. Hobbs	Office expenses	9.88
18	Department of the Interior of Porto Rico	Office rent	150.00
	Successors of J. B. Vicini	do	120.00
	Cuba Submarine Telegraph Co	Services	4.10
	International Ocean Telegraph Co	do	1.12
	Postal Telegraph-Cable Co	do	109.60
	E. C. Thompson	Office expenses	4.70
	do	Traveling expenses	31.75
20	Wm. B. Stockman	Office expenses	11.68
	A. V. Randall	do	20.25
	Louis Dorman	do	31.25
23	Jos. L. Cline	Traveling expenses	13.80
	H. E. Hobbs	Office expenses	13.11
	C. H. Richardson	do	12.24
Aug. 6	M. G. Copeland & Co	Flags	241.00
	W. B. Moses & Sons	Chairs	67.50
7	T. F. Davis	Office expenses	9.17
	Paul De Graw	do	10.50
	C. E. Ashcraft	do	21.48
	P. Fernandez y Ca	Printing bulletins	79.50
	Sociedad Anónima Luz Eléctrica	Electric light	21.60
	Jamaica Telephone Co., Limited	Rent	23.25
12	Western Union Telegraph Co	Service	18.66
14	Manuel G. Roves	Office rent	40.00
	Teresa Joergy Belot	do	100.00
	E. Nuttall	do	109.50
	D. O. Riviere	do	60.00
	Clinckett & Coates	do	88.00
	Laureano Fuentes	do	30.00
	do	do	30.00
	A. B. Smith	do	85.35
	Croney & Co	do	30.00
17	Pennsylvania R. R. Co	Passenger transportation	6.90
	New York and Cuba Mail Steamship Co	do	45.00
	G. H. Noyes	Traveling expenses	30.03
26	José Castillo	Ice	6.97
	Ed. Newman & Co	do	7.00
Sept. 9	Louis Dorman	Traveling expenses	90.60
	News Publishing Co	Printing crop bulletins	87.30
10	Paul De Graw	Office expenses	2.50
23	Peninsular and Occidental S. S. Co	Passenger transportation	22.50
	Boulton, Bliss & Dallett	do	40.00
	Savannah, Florida and Western R. R. Co	do	21.55
Oct. 3	Harry O. Ceren	Traveling expenses	25.21
14	Baltimore and Ohio R. R. Co	Passenger transportation	18.75
	Pittsburg, Cincinnati, Chicago and St. Louis Rwy. Co.	do	15.35
	The Pennsylvania R. R. Co	do	14.80
	Total		2,714.16

RECAPITULATION.

First quarter	$10,485.95
Second quarter	14,215.59
Third quarter	17,993.20
Fourth quarter	13,284.12
Supplemental	2,714.16
Total	58,693.02

57TH CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { DOCUMENT No. 334.

U. S. DEPARTMENT OF AGRICULTURE.

ANNUAL REPORT

OF THE

OFFICE OF EXPERIMENT STATIONS

FOR

THE YEAR ENDED JUNE 30, 1901.

FEBRUARY 6, 1902.—Referred to the Committee on Printing and ordered to be printed.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1902.

THE OFFICE OF EXPERIMENT STATIONS.

STAFF.

A. C. TRUE, Ph. D., Director.
E. W. ALLEN, Ph. D., Assistant Director and editor of Experiment Station Record.

EDITORIAL DEPARTMENTS.

Assistant Director and H. W. LAWSON, B. S., Chemistry, dairy farming, and dairying.
W. H. BEAL, B. A., M. E., Meteorology, fertilizers, soils, and agricultural engineering; editor of Experiment Station Work.
W. H. EVANS, Ph. D., Botany and diseases of plants.
C. F. LANGWORTHY, Ph. D., Foods and animal production.
J. I. SCHULTE, B. S., Field crops.
E. V. WILCOX, Ph. D., Entomology and veterinary science.
C. B. SMITH, M. S., Horticulture.
D. J. CROSBY, M. S., Agricultural institutions.
WILLIAM HENRY, Indexing and proof reading.
G. A. HARLOW, Librarian.
Mrs. C. E. JOHNSTON, Clerk, in charge of routine business.
SARAH L. SOMMERS, Record clerk.

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F. E. RADER, B. S., Assistant at Sitka.
H. P. NIELSEN, Assistant at Kenai.
——— ———, Assistant at Rampart.

HAWAII EXPERIMENT STATION.

JARED G. SMITH, Special agent in charge, Honolulu.
T. F. SEDGWICK, Agriculturist.
FRANK E. CONTER, Farm foreman.

PORTO RICO EXPERIMENT STATION.

F. D. GARDNER, Special agent in charge, Rio Piedras, near San Juan.
O. W. BARRETT, Entomologist and botanist.
JAMES MACKINLAY, Farm foreman.

NUTRITION INVESTIGATIONS, MIDDLETOWN, CONN.

W. O. ATWATER, Ph. D., Special agent in charge.
C. D. WOODS, B. S., Special agent at Orono, Me.
F. G. BENEDICT, Ph. D., Physiological chemist.
R. D. MILNER, Ph. B., Assistant.

IRRIGATION INVESTIGATIONS.

ELWOOD MEAD, M. S., C. E., Irrigation expert in charge.
C. T. JOHNSTON, M. S., C. E., Expert assistant in charge of Cheyenne office.
J. M. WILSON, C. E., Agent and expert in charge of California office.
R. P. TEELE, M. A., Editorial assistant.
CLARENCE E. TAIT, B. S., Assistant in charge of maps and illustrations.
A. P. STOVER, B. S., Assistant.
J. D. STANNARD, B. S., Assistant.
FRANK ADAMS, B. A., Agent and expert.
FRANK BOND, B. S., Agent and expert.

To the Senate and House of Representatives:

I transmit herewith the annual report of the Office of Experiment Stations, prepared under the direction of the Secretary of Agriculture, which includes a report on the work and expenditures of the agricultural experiment stations in the United States for the fiscal year ended June 30, 1901, in accordance with the act making appropriations for the Department of Agriculture for the said fiscal year.

The attention of Congress is called to the request of the Secretary of Agriculture that 6,000 copies of the report be printed for the use of the Department of Agriculture, and that provision be made to print such a report annually.

THEODORE ROOSEVELT.

WHITE HOUSE, *January 29, 1902.*

LETTER OF TRANSMITTAL.

U. S. Department of Agriculture,
Office of the Secretary,
Washington, D. C., January 25, 1902.

Sir: I have the honor to transmit herewith the annual report of the Office of Experiment Stations, prepared in accordance with my instructions. This includes a report on the work and expenditures of the agricultural experiment stations established under the act of Congress of March, 2, 1887, for the fiscal year ended June 30, 1901, in compliance with the following provision of the act making appropriations for this Department for the said fiscal year:

> The Secretary of Agriculture shall prescribe the form of the annual financial statement required by section three of the said act of March second, eighteen hundred and eighty-seven, shall ascertain whether the expenditures under the appropriation hereby made are in accordance with the provisions of the said act, and shall make report thereon to Congress.

Reports are also included on the experiment stations in Alaska, Hawaii, and Porto Rico, which are provided for in the appropriation act aforesaid and are directly managed by this Department.

If this report is published by Congress it is desirable that 6,000 copies should be provided for the use of this Department, and that provision be made to print such a report annually.

I have the honor to be, sir, your obedient servant,

James Wilson,
Secretary.

The President.

LETTER OF SUBMITTAL.

OFFICE OF EXPERIMENT STATIONS,
Washington, D. C., January 25, 1902.

SIR: I have the honor to present herewith the annual report of the Office of Experiment Stations, which includes a report on the work and expenditures of the agricultural experiment stations in the United States for the fiscal year ended June 30, 1901. In addition to the brief accounts of all the stations, the detailed reports of the special agents in charge of the stations in Alaska, Hawaii, and Porto Rico, and summary statements regarding the special investigations in charge of this Office have been included for the first time. In the preparation of this report Mr. D. J. Crosby and Miss M. T. Spethmann, of this Office, have rendered valuable assistance.

Very respectfully,

A. C. TRUE,
Director.

Hon. JAMES WILSON,
Secretary of Agriculture.

KEY TO ABBREVIATIONS.

Agr., Agriculture, Agriculturist, Agricultural.
Agron., Agronomy, Agronomist.
Anal., Analytical.
Archi., Architecture.
Arith., Arithmetic.
Assoc., Associate.
Asst., Assistant.
Astron., Astronomy.
Bact., Bacteriology, Bacteriologist.
Biol., Biology, Biologist, Biological.
Bot., Botany, Botanist, Botanical.
Chair., Chairman.
Chem., Chemist, Chemistry, Chemical.
Climat., Climatology, Climatologist.
Dept., Department.
Dir., Director.
Econ., Economy, Economic, Economics.
Engin., Engineer, Engineering.
Ent., Entomology, Entomologist.
Expt., Experiment, Experimental.
Flor., Floriculture, Florist.
For., Forestry.
Gard., Gardener, Gardening.
Geol., Geology, Geologist, Geological.
Gov., Governor.
Hort., Horticulture, Horticulturist.
Husb., Husbandry, Husbandman.
Indus., Industrial, Industries, Industry.
Irrig., Irrigation.
Lab., Laboratory.
Libr., Library, Librarian.
Met., Meteorology, Meteorologist.
Min., Mineralogist, Mineralogy.
Myc., Mycology, Mycologist.
Path., Pathology, Pathologist.
Phys., Physics, Physicist, Physical.
Physiol., Physiology, Physiological, Physiologist.
Pomol., Pomology, Pomologist.
Pract., Practical, Practice.
Pres., President.
Sci., Science.
Sec., Secretary.
Sta., Station.
Sten., Stenographer, Stenography.
Supt., Superintendent.
Treas., Treasurer.
Univ., University.
V. Dir., Vice-Director.
Veg., Vegetable.
Vet., Veterinary, Veterinarian.
Vit., Viticulture, Viticulturist.
Zool., Zoology, Zoologist.

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ANNUAL REPORT OF THE OFFICE OF EXPERIMENT STATIONS, JUNE 30, 1901.

WORK AND EXPENDITURES OF THE AGRICULTURAL EXPERIMENT STATIONS.

SUMMARY.

This is the seventh annual report on the work and expenditures of the agricultural experiment stations in the United States, made by the Director of the Office of Experiment Stations, under instructions from the Secretary of Agriculture. As heretofore, the report is based on three sources of information, viz, the annual financial statements of the stations, rendered on the schedules prescribed by the Secretary of Agriculture, in accordance with the act of Congress; the printed reports and bulletins of the stations, and the reports of personal examinations of the work and expenditures of the stations made during the past year by the Director, assistant director, and one other expert officer of the Office of Experiment Stations.

The agricultural experiment stations in the different States and Territories, as well as the colleges with which they are connected, have been unusually prosperous during the past year. Two things have especially contributed to the greater expansion and increasing efficiency of their investigations. These are their closer affiliation with this Department and the material enlargement of the resources of the agricultural colleges, by means of which the stations have directly or indirectly been benefited.

COOPERATION BETWEEN THE STATIONS AND THE DEPARTMENT.

Much progress has been made in determining the lines in which the stations can most effectively cooperate with the Department, and the methods of arranging and conducting cooperative operations. Since both the stations and the Department have had enlarged resources, it has been possible not only to increase the number of cooperative enterprises, but also to conduct them on a larger scale. In some cases it has been found desirable to form groups of stations to investigate some problem affecting a large region. Thus, for example, a group

of stations, in cooperation with the Bureau of Plant Industry, is engaged in investigations on the breeding of varieties of cereals adapted to the Northwest. In other cases a single station is sufficiently aided by the Department to enable it to undertake the thorough treatment of problems in a special line. Thus the Pennsylvania Station, in cooperation with the Bureau of Animal Industry, is preparing to make elaborate researches in animal nutrition, and for this purpose has devised and built a respiration calorimeter for experiments with large animals, which in size and complexity surpasses any apparatus hitherto used for such experiments. In other cases, two or more branches of the Department combine to work in conjunction with a station on some complex problem. Plans are now being made, for example, for an extensive experiment on the problems of range conservation and improvement, in which the Arizona Station will unite with the Bureaus of Forestry and Plant Industry and the Office of Experiment Stations (irrigation investigations). It is evident that a very great variety of effective combinations can be made which will result in a union of forces thoroughly acquainted with local conditions with those having broad views and relations. Such a strong combination of forces for attacking the problems of agriculture exists nowhere else. It is believed, therefore, that largely increased benefits will soon accrue to our agriculture from this union of the stations with the Department. At the same time the stations were never so strong locally, and are better equipped than ever before to work by themselves on problems of immediate importance to their own constituencies.

The records of this Office show that the Department is at present cooperating with the stations in 43 States and Territories. Among the subjects on which cooperative investigations are being conducted are the following: Tests of varieties of grasses and forage plants in many localities; special experiments with grasses and forage plants for the arid region and the improvement of range lands; breeding experiments with plants, especially cereals; experiments with hybrid orange trees; the culture of sugar beets, dates, and tobacco; planting forest trees; the nutrition of farm animals and man; the gluten content of wheat; plants poisonous to stock; soil investigations; injurious insects, especially the codling moth and locust, and irrigation investigation.

EXPANSION OF STATE AID TO THE EXPERIMENT STATIONS.

With the aid of funds given by the States, buildings have been erected during the past year at a number of the agricultural colleges, which will be used in whole or in part by the experiment stations. Wyoming has just completed a new science hall at a cost of $35,000. The New York State Station has erected a residence for the director and is now expending about $8,500 in remodeling the old residence

into an administration building. North Dakota has erected two barns at a cost of $18,000 to replace the barn burned last year. Pennsylvania has finally completed and equipped its calorimeter building. Oregon has a new $3,000 station building; Storrs Agricultural College, a new dairy building; Alabama, a veterinary dissecting building and a new chemical laboratory; Colorado, an insectary; Washington, a greenhouse and insectary; Virginia, a new main barn and a piggery and abattoir; the Missouri State Fruit Experiment Station, a new station building; Kentucky, a barn for curing tobacco; New Jersey, a new barn, and Idaho a piggery.

State appropriations for substations have been made as follows: In Kansas, $3,000 a year for the establishment and maintenance of a substation at the Fort Hays Reservation; in Michigan, $2,000 for the South Haven Fruit substation and $3,000 for the Chatham substation; in Minnesota, $11,200 for improvements at the substations, which are maintained by State appropriation; in Texas, an increase of the appropriation for the Beeville substation from $5,000 to $7,500 for two years and $5,000 per annum for a new substation; in Oregon, $5,000 a year for two years for a substation in eastern Oregon; in Utah, $6,000 for two years to establish a fruit experiment station in southern Utah; in Washington, $11,200 for the substation at Puyallup, including $2,000 for improvements. Alabama has continued State aid to the Canebrake Station $2,500, and to the Tuskegee Station $1,500, and Missouri has appropriated $26,525 for buildings and maintenance at the new State Fruit Experiment Station.

Provision for the printing of station publications in whole or in part is made in the following States: California, Connecticut (both stations), Kansas, Kentucky, Maine, Massachusetts, Michigan, Minnesota, Missouri (both stations), New Hampshire, New Jersey, New York (both stations), North Dakota, Ohio, Pennsylvania, Rhode Island, Vermont, West Virginia, and Wisconsin.

The importance of the work of the experiment stations as distinct departments of the agricultural colleges is beginning to be recognized by special appropriations by the State legislatures for the equipment and investigations of the stations. A notable example of this was an act of the recent legislature of Illinois which appropriated $46,000 for the next two years to be expended by the station in that State as follows: Experiments with corn, $10,000; soil investigations, $10,000; investigations in horticulture, $10,000; experiments in stock feeding, $8,000; dairy experiments, $5,000; and sugar-beet experiments, $3,000. The Connecticut legislature has appropriated $2,000 per year for two years to be expended by the New Haven Station in making forestry investigations, $3,000 per year for two years for nursery inspection, and $1,800 a year for investigations at the Storrs Station on the food and nutrition of man. Florida has given $5,000

a year for two years, and Washington $1,250 a year for two years for veterinary work. The Nebraska legislature has appropriated $2,500 for investigations of the cornstalk disease and sorghum poisoning of cattle. Kansas has appropriated $5,000 for the purchase of pure-bred farm stock, with a view to extending the station work in animal husbandry. New Jersey has provided $3,000 for the inspection of foods and feeding stuffs by the State Station.

Now that the stations are well organized, appropriations of this character are likely to be most efficient means for increasing their general usefulness to the agriculture of the respective States. Funds so appropriated that they can be expended for particular investigations which may be carried on so as to broadly meet the requirements of the State as a whole, and conducted under the immediate supervision of the experienced expert officers of the station, are most likely to give results of permanent value and wide application.

PROBLEMS OF STATION ORGANIZATION.

Questions relating to the organization of the stations still continue to require the attention of the authorities charged with their management. In a number of States the organization and general attitude of the governing boards are not yet wholly satisfactory. For various reasons the boards of control as at present constituted are often not able to give close enough attention to the requirements of the stations to thoroughly understand the nature of their operations and the requisites for their most efficient work. This may be due to the frequent changes in the membership of the board, to infrequent and short meetings of the board, or to mistaken ideas on the part of the board of its proper functions. Under existing conditions no one effectual remedy for these evils is apparent. It may, however, be properly urged that the governors or other appointing officers in the several States should exercise great care in the selection of members of these boards, and should insist that they confine themselves chiefly to the selection of competent expert officers to have the direct management of the stations. It has been suggested that good might result from closer relations between this Office and the boards of control. This could be secured only by having representatives of the Office attend meetings of the boards. It is possible that an arrangement might be made by which a representative of the Office should visit each station annually at a time when the governing board is in session. This would, however, require a larger expense for traveling than is possible with the present resources of the Office.

Owing to the increased number of cooperative enterprises between the Department and the stations, it is more than ever important that the management of the stations should proceed on well defined and

permanent policies, and it may well be that the Office could accomplish much good by cultivating closer relations with the boards of control. This matter should certainly be considered in future plans for the operations of the Office.

Progress is being made in the separation of the offices of president of the college and director of the station. During the past year the office of director has been separated from that of president in Nebraska, North Carolina, and New Hampshire. In New Mexico and Tennessee, where the president retains the directorship, a vice-director has been appointed to have general charge of the station business. In South Dakota the president of the college has recently been made acting director, but it is understood that this is only a temporary arrangement pending the selection of a new director. Excluding South Dakota, there are at present 10 States and Territories in which the college president performs the functions of director of the experiment station. It is hoped that this number will be further reduced during the coming year.

Progress has also been made in securing for station officers better opportunities for prosecuting the work of research without undue hindrances arising from duties as teachers in the colleges.

In a number of instances newly appointed officers of the experiment stations have no duties as teachers in the college, and in other instances changes have been made by which the amount of teaching required of station officers has been materially reduced. Experience is each year showing more conclusively that if station officers are to accomplish the best results in agricultural investigations, their research work must be made their primary business, before which routine duties of every kind must give way as the conditions of the original work demand. Our most successful stations are now managed on the principle that they constitute university departments of the colleges, that they are thus at the summit of our system of agricultural education, and that they must be managed on the same principles as the great scientific laboratories in the universities are conducted; that is, their officers must be the best-trained experts in their respective lines, and they must be able to devote their time and energy quite fully to their investigations. They should not be expected to do any considerable amount of teaching, especially in the elements of the sciences. If they go into the class room at all, it should be rather to lay before advanced students the methods and results of the investigations which they are conducting. Undoubtedly, the financial exigencies of many of our agricultural colleges will for some time prevent the attainment of this ideal in station management, but we may reasonably expect that wherever increases in the resources of these institutions will permit, changes in this direction will be made in the management of the stations.

RELATION OF SALARIES TO OTHER STATION EXPENSES.

In planning the work of experiment stations, a common mistake is to attempt work in too many different lines. This necessitates the employment of a considerable number of officers on the station staff and thus unduly increases the salary roll. The result is that after the salaries and printing bills are paid, the remainder of the station income, when divided among the different officers charged with making the investigations, affords only a small sum for the general expenses of each investigation. This makes it necessary to conduct the individual investigations on so limited a scale that the results are either entirely unsatisfactory or do not offer a safe guide for practical application. Those stations have had the greatest success in their operations which have so limited the lines of work to their resources as to enable them to conduct investigations and then attempt in a thorough way to reduce the results to a practical basis. In a number of States the stations should either be given larger financial support or else they should contract their operations within narrower lines. Generally speaking, the relation of salaries to other expenses should receive the closer attention of governing boards and general officers of the station.

LACK OF TRAINED WORKERS.

When the experiment stations were first organized under the act of Congress of 1887, there was an insufficient number of trained investigators to fill the positions opened by the rapid expansion of the experiment station movement in this country. As their work developed, this difficulty was largely overcome, especially as the agricultural colleges gave increased attention to supplying the need for trained men in the stations. But within the past year this difficulty has again presented itself in a new form. The results of practical importance already attained by the Department and the stations have inspired the public with such confidence in the value of agricultural research that Congress and the State legislatures have been unusually liberal to these institutions. At the same time, business enterprises requiring scientific and expert knowledge and skill for their most successful management have been unusually prosperous. The managers of these enterprises have awakened to a much clearer appreciation of the value of the services of such men as are most successful workers in our institutions in agricultural education and research. An increasing number of our best workers in these institutions have therefore received very attractive offers from the business world. So many public and private positions for well-trained and experienced workers in agricultural science and research have been opened that in some lines the demand has outrun the supply.

This has led to numerous changes in the personnel of our experiment stations, partly through the transfer of their officers to outside enterprises, and partly through the changes of officers from one station to another on account of differences in salary and other attractions.

The lack of trained investigators is especially manifest in those lines of research which have grown out of the more recent development of agricultural science. That is, it is most difficult to find efficient investigators in such lines as soil physics, agronomy, zootechny (animal production), agricultural bacteriology, and agricultural engineering.

To aid in remedying this lack, this Department is taking into its service as many young men as it can, who come in the capacity of scientific aids and student assistants. In this way it hopes not only to train men for promotion in its own service, but also to send back trained workers to the agricultural colleges and experiment stations in the different States. Under present conditions the number of such graduate students which the Department can bring into relation to itself is quite limited.

With a view to further remedying this difficulty, a movement has been inaugurated by the Ohio State University for the establishment of a Graduate Summer School of Agriculture. This movement has received the indorsement of the honorable Secretary of Agriculture and also of the Association of American Agricultural Colleges and Experiment Stations. The Ohio State University has undertaken to defray the expenses of the first session of the school, but if this proves a success, the school will hereafter be under the control of a committee appointed by the Association of Colleges and Stations. It will thus become a cooperative enterprise, and to further carry out this idea it is proposed to hold future sessions at institutions in different parts of the country. Plans are now being made to hold the first session in July, 1902. Great interest is being manifested in this project both in this Department and in the agricultural colleges. The Director of this Office will act as dean of the school and a considerable number of the leaders in agricultural education and research in this country have consented to serve on its faculty.

By bringing together in this way the most efficient and experienced workers in our agricultural institutions, the younger men already engaged in agricultural education and research, and a number of the more recent graduates of our colleges who desire to fit themselves as teachers or investigators in agricultural lines, it is believed that even though the sessions of the school cover a short period, they will do much to inspire and encourage more thorough and satisfactory preparation for work in our institutions for agricultural education and research.

DISSEMINATION OF RESULTS OF STATION WORK.

To disseminate the results of their work among our farmers the stations are issuing a great variety of publications and distributing them very widely. These publications not only include detailed accounts of their investigations, but also short summaries of the practical results and compilations of information on a great variety of agricultural topics. They are also giving much attention to the dissemination of information through the agricultural press by means of press bulletins and special articles. The number of books prepared by officers of the agricultural colleges and experiment stations is constantly growing and these range all the way from elaborate scientific treatises to very elementary and popular works.

Undoubtedly much progress has been made in recent years in acquainting our farmers with the results of experiment station work, and it is obvious even to the superficial observer that results of the work of the stations are being from year to year more generally applied on farms in different parts of the country.

But while this is true, there is still a great amount of ignorance regarding the work of the stations and especially regarding the ways in which results obtained by the stations may be applied on the farm. While the spread of education and the spirit of progress among our farmers within the past few years has been very remarkable, there is still a mass of ignorance and false conservatism which in the aggregate constitutes a vast dead weight on our agriculture. As long as one hundred out of every thousand men of voting age on our farms are unable to either read or write (as is shown to be the case by the census of 1900) it is not to be expected that the publication of the results obtained at our experiment stations through printed documents will suffice to meet the needs of our agricultural population regarding the progress of the art. Even those farmers who are accustomed to read ordinary books and newspapers are often not prepared to understand and appreciate the station publications because of lack of the necessary preliminary information. To supplement the station publications and bring the results of their work more directly home to the farmer, the stations have felt obliged to participate largely in the farmers' institutes now so generally held in many of our States. While this work has, strictly speaking, been outside their province, at least as determined by the Federal law under which most of them are organized, it has nevertheless been an efficient means of strengthening their position and securing the confidence and support of their farmer constituencies. The problem is, therefore, how to develop the farmers' institute movement in its relation to the stations so as to make the institutes more efficient and at the same time to prevent their interfering too much with the duties of station officers as investigators and writers.

FARMERS' INSTITUTES.

So important has this question of the relation of the stations to farmers' institutes become that this Office has during the past year more than ever given attention to this matter. As the result of our inquiries we are more fully convinced than ever before of the importance of the farmers' institutes as agencies for the education of our farmers. They should be liberally supported and in many parts of our country should be much more thoroughly organized than at present. According to the incomplete statistics of the institutes collated by this Office, they are now held annually in 43 States and Territories. In 19 of these they are in charge of officers in agricultural colleges or experiment stations; in 17 they are under State or county officials, and in 7 they are under the joint control of State officers and college and station officers. In the aggregate about 2,000 farmers' institutes are annually held in the United States, which are attended by over half a million farmers.

In a few of our States the farmers' institutes are quite thoroughly organized, have liberal financial support, and reach the farmers quite widely, but in many States and in the Territories the movement is yet in a comparatively weak condition and the organization and means for this work are inadequate. Moreover, even in the States where the institutes are most thoroughly organized and have had the greatest success, new problems relating to their management have arisen with the growth of the movement. For example, there is increasing difficulty in some States in securing workers thoroughly qualified for this kind of service who can attract large audiences of farmers and hold their attention through the meetings. It is a common experience that after the institutes have been held for a number of years in a given locality the farmers are not so ready to listen to local speakers, or those who have nothing to give to them except what has come within the range of their own limited personal experience, however successful they may have been as practical farmers. This is easily explained as a natural result of successful institutes. They arouse the interest of intelligent farmers in the improvement of their art and set them to studying the progress of agriculture as it is shown in the agricultural press, recent books, and the publications of the experiment stations, boards of agriculture, and the United States Department of Agriculture. In this way these men discover that the problems of the farm can not be settled off-hand by individuals, however successful they may be in a limited range of practice, but that the solution of these problems requires long-continued investigation and the joint labors of many scientific and practical workers.

RELATION TO THE STATIONS.

Farmers demand, therefore, that institute workers shall have a wide range of knowledge regarding the science and practice of agriculture

and particularly up-to-date information regarding the progress that is being made throughout the world in studying problems in agriculture both at the experiment stations and on the farm. This has led to a demand on the officers of our agricultural colleges and experiment stations for service at the farmers' institutes far beyond their ability to meet. Indeed, this demand has often been so urgent that in attempting to meet it these officers have been obliged to sacrifice their duties at the colleges and stations to the farmers' institute work. This has called forth protest from the managers of these institutions and even from the students, and has necessarily led to a restriction of the amount of service which these officers are permitted to give to the institutes. The colleges and stations have done and will continue to do much to promote the farmers' institutes, but with the growth of the movement they can not be relied upon to take relatively as large a share in this enterprise as they have hitherto unless they have special officers for this work. Moreover, even if the officers of the colleges and stations could do much more work in the institutes than is possible under present conditions, they could not fully meet the demand for trained workers in these institutes. There is need of developing a class of institute workers who shall combine successful practical experience and scientific knowledge of agriculture with the ability to address large audiences of farmers in a way not only to hold their attention, but also to impart to them definite information and instruction. Such men are now difficult to find, but without doubt the growing demand for them may be filled by offering sufficient inducements to young men to prepare themselves for a career as institute workers. This involves the creation of a corps of institute workers who shall receive sufficient salaries to induce them to make specific preparation for their work and to enable them to keep the information in their addresses up to date by studies pursued from year to year. This, of course, can not be done without increased resources for the institutes, but there is every reason to believe that the States will provide these when once the farmers are sufficiently aroused to the importance of this movement to insist upon the more perfect organization of institutes. At any rate, this problem of trained institute workers is a very important one and much thought and study should be given by our institute managers to its solution.

Another problem of increasing importance relates to the ways and means of reaching the masses of our farmers through the institutes. On the supposition that half a million of farmers now annually attend the institutes, it will be seen that out of the 10,000,000 farmers in the United States only one in twenty is directly reached by the institutes or 9,500,000 are not reached. These are without doubt in the main the most intelligent men in the business, and whatever good they receive from the institutes is disseminated to a considerable extent

among their less aggressive and more ignorant associates. But the institutes should directly reach a far greater proportion of our farmers. To do this various expedients will have to be adopted to adapt the institutes to the needs of the different classes of our agricultural population. For example, in communities where the farmers do not read the agricultural papers or experiment station bulletins, or are remote from the centers of advanced agricultural practice, demonstrations of new methods, implements, and apparatus will often have to be made. Thus in England great success has attended the traveling dairy schools, and in New York the farmers' institutes have been supplanted with demonstrations of improved culture and manuring of potatoes and other crops through simple experiments in a large number of localities. The Tuskegee Institute, in Alabama, is holding dairy institutes at the country crossroads, where the operation of simple dairy apparatus is shown to negro farmers, who come largely on muleback or on foot to attend these meetings.

RELATION TO THIS DEPARTMENT.

These examples of institute problems have been given to illustrate the fact that this movement has now reached such a stage of its development that the comparatively simple methods hitherto followed in the organization and maintenance of the institutes are not adequate for an enterprise of such magnitude as this has become. The solution of these problems will require much study, involving a comparison of methods employed in the different States and countries. In its national and international aspects there is room for much useful work by the United States Department of Agriculture, which may well aid in this as well as in other movements for the education of our farmers and the improvement of our agriculture.

Thus far the Department has done comparatively little toward helping the institutes directly. The chief service which it has rendered has been through the distribution of its publications to institute workers, who have thus been enabled to keep in touch with the progress of agriculture as reflected in these publications. Occasionally some officer of the Department has spoken at the institutes, but there has been no regular plan for the oral dissemination of the information gathered by the Department. The Office of Experiment Stations has in recent years issued a few publications giving accounts of the work of institutes in this country and similar work abroad. Following the natural course of such movements in the United States, the farmers' institutes have been developed, first through individuals and local organizations, and secondly, through the aid of the States, but the time has now come for the nation to do something to promote this great enterprise, and the present Secretary of Agriculture is convinced that the national

department over which he presides may properly engage in this work and usefully extend its operations in the interests of farmers' institutes.

Because of the intimate connection of these institutes with the general movement for agricultural education and research represented by the agricultural colleges and experiment stations, the Office of Experiment Stations is the branch of the Department which may most naturally be charged with the promotion of the interests of the farmers' institutes, and this Office is being encouraged by the Secretary to extend its efforts in this direction. From the study which we have already made of this matter, we think we are able to see several ways in which the Department may take definite action along this line. The following are some of the ways in which it appears to us the Department may help the institute:

(1) By collating and publishing information regarding the institute movement at home and abroad. This should be done in a regular way and with definite reference to the needs of institute work in this country.

(2) By furnishing the institute workers with the Department publications and information through correspondence. This is already done to a considerable extent, but may be more efficiently and thoroughly done by having in the Department a regular agency for this work. The institute workers would undoubtedly appeal to the Department with much more freedom if they felt that their work was definitely recognized there, as is the case with the agricultural colleges and experiment stations, whose officers are seeking the advice and assistance of the Department more and more each year. The institute workers should also be made to understand that they are very welcome to come to the Department, and by residence at Washington for a longer or shorter time, have opportunities for acquiring information through personal contact with the officers of the Department, the use of its library, etc.

(3) By advising and assisting institute managers with reference to perfecting organization and strengthening the work in weak places. This may be done by conferences between institute managers and the other officers of the Department who are definitely studying the problems of the institute movement, largely through observations made in the different States and Territories and foreign countries. It is in this way that the Office of Experiment Stations has been able to do much to help the experiment stations throughout the country. The visits of the officers of the Department to the stations in the different States, and the conferences held at Washington and at the meetings of the Association of American Agricultural Colleges and Experiment Stations have, it is believed, done much to systematize the work of the stations and make them more efficient. In a similar way representatives of this Office might visit the managers of the institutes and

the institutes themselves in different States and Territories, and meet representative institute managers and workers at Washington or in conferences held in different parts of the country. Already there is a successfully conducted Association of American Institute Workers which may easily be developed so as to become a very important factor in the further development of the farmers' institute movement.

(4) By sending out lecturers to address representative institutes in different States on the work of the Department. Thus far the Department has trusted very largely to its publications for the dissemination of the information which it gathers, and which has grown to be very large in extent and variety. It would hardly be practicable for the Department to be represented in a single year at any considerable number of institutes in any one State or Territory, but it is believed that more might be done to bring the work of the Department directly to the attention of the leaders in this enterprise through the attendance of Department officers at representative meetings, which might be held from time to time in the different States under such conditions as would bring together relatively large numbers of farmers. In this way the influence of the Department would be extended and its officers would have opportunities which they now lack for finding out what the farmers really desire to have the Department do for their benefit. An organization in the Department to promote this work would undoubtedly make it possible for the Department to do much more in this direction, even without any additional funds especially devoted to the purpose.

(5) In general, by acting through its Office of Experiment Stations as a sort of clearing house for the farmers' institute movement as it has done in the case of the agricultural experiment stations; that is, it would be a center for the focalization and dissemination of information and influences which would serve to develop farmers' institutes and make them a more efficient means for the education of our farmers and the improvement of our agriculture.

In order to bring this matter to a direct issue in the Department, the Secretary of Agriculture has included in his estimates to Congress an item of $5,000 to be added to the appropriation for the maintenance of the Office of Experiment Stations for the express purpose of enabling this Office to extend its work in relation to farmers' institutes. If Congress makes this appropriation, it will be used in employing an officer who will give his time and energy to promoting the interests of the institutes. This officer will be sent throughout the Union to advise with the farmers' institute managers regarding the ways in which the Department may help the institutes, will study the problems of institute management at home and abroad, and will seek to shape the Department's work for the institutes so that it may be most helpful to this enterprise. It is thought that in this way the lines of work may be

best laid so as to give promise of making the Department an acceptable and efficient agency for the promotion of the general interests of the institutes throughout the country.

EXHIBITS AT EXPOSITIONS.

The collective experiment station exhibit at the Paris Exposition of 1900, made under the general supervision of a committee of the Association of American Agricultural Colleges and Experiment Stations working in cooperation with this Office, was described in my report for 1900. At the close of the exposition this exhibit was packed for shipment under the supervision of Mr. J. I. Schulte of this Office and it arrived in this country in good condition. It was then transferred to Buffalo and with some additions was installed at the Pan-American Exposition.

Owing to the limited amount of space in the Government building available for the exhibits of this Department, only that portion of the experiment station exhibit which illustrated functions of this Office was installed in the Government building. By the courtesy of the general officers of the Pan-American Exposition, the remainder of the station exhibit was placed in the agricultural building, where it was located in immediate conjunction with the exhibits made by the New York State and Tennessee experiment stations. In this way the different functions of our experiment stations were more fully illustrated. A portion of the exhibit has since been transferred to Charleston, S. C., and installed at the South Carolina Interstate and West Indian Exposition now in progress in that city. Dr. C. F. Langworthy has represented this Office at the Buffalo and Charleston expositions.

At the recent meeting of the Association of American Agricultural Colleges and Experiment Stations it was decided to undertake the preparation of a collective exhibit of the agricultural colleges and experiment stations at the Louisiana Purchase Exposition to be held in St. Louis in 1903. The committee appointed to take charge of this exhibit is as follows: W. H. Jordan, director of the New York State Experiment Station; W. M. Hays, professor of agriculture, University of Minnesota; H. J. Waters, director of the Missouri Experiment Station; C. F. Curtiss, director of the Iowa Experiment Station, and the Director of this Office.

THE ASSOCIATION OF COLLEGES AND STATIONS.

The Association of American Agricultural Colleges and Experiment Stations held its fifteenth annual convention at Washington, D. C., November 12–14, 1901. The attendance was unusually large, and a considerable number of important matters relating to the general

interests of the colleges and stations were brought to the attention of the association and discussed. A brief account of the Washington meeting is given on page 36 of this report.

THE OFFICE OF EXPERIMENT STATIONS.

During the past year the work of the Office of Experiment Stations has continued to increase by the addition of new enterprises and the further development of those previously undertaken. Agricultural experiment stations under the direct management of this Office have been established in Hawaii and Porto Rico, and in Alaska the station work has been extended to include experiments in the Yukon Valley. Both the nutrition and irrigation investigations have been conducted on a larger scale than in previous years. The amount of material prepared for publication during the year has exceeded that for any similar period since the establishment of the Office. Unusual opportunities have been afforded for the study of the more general problems relating to the organization and development of agricultural education and research, and there is good reason for believing that along the lines already laid the Office may be able in the future to extend its usefulness in promoting these important interests. A brief account of the general business of the Office will be found on page 42.

ALASKA EXPERIMENT STATIONS.

The experiment stations at Sitka and Kenai have been continued and a station has been established at Rampart in the Yukon Valley. The chief new feature of the investigations in Alaska during the past year has been the more thorough study of the agricultural possibilities of the interior, especially of the Yukon Valley and the Copper River region. For this purpose Professor Georgeson made journeys through the Yukon Valley in the summers of 1900 and 1901, and Mr. Isaac Jones, who has been the assistant at Rampart, traversed the Copper River region in the summer of 1901. Through these journeys definite information has been obtained regarding the attempts at agricultural operations already made in the regions traversed and the possibilities for the extension of such operations. It was shown that considerable quantities of hardy vegetables, such as potatoes, cabbage, cauliflower, turnips, lettuce, and radishes are already being grown in the interior and there are large areas which may be used for this purpose and also for the production of grasses and forage plants. At the station at Rampart rye and barley were matured. At Sitka the experiments with cereals, forage crops, and vegetables were continued and a considerable number of varieties were successfully grown. Good silage was also made of native grasses and stored in a log silo.

At Kenai the experiments with cereals and vegetables were con-

tinued with considerable success. Seeds were distributed to 400 persons living in different parts of Alaska and a considerable number of reports were received of those grown during the season of 1900. It is evident that the efforts of the Government to aid in the development of agriculture in Alaska are greatly appreciated by residents of that Territory, and that they have already received substantial benefits from the work of the Alaska Experiment Station.

The assistant director of this Office, Dr. E. W. Allen, made a tour of inspection to the stations at Sitka and Kenai and reported favorably on their work. A brief report of the operations of the Alaska stations will be found on page 54, and a detailed report of the special agent in charge is given on pages 239–359.

HAWAII EXPERIMENT STATION.

The first appropriation for the establishment and maintenance of an agricultural experiment station in Hawaii was for the fiscal year covered by this report. A preliminary investigation of the agricultural conditions existing in Hawaii with reference to the establishment of an experiment station was made by Dr. W. C. Stubbs, director of the Louisiana Agricultural Experiment Stations, acting under the direction of this Office. On the basis of his report a station was established with headquarters at Honolulu, and put in charge of Mr. Jared G. Smith. The station was located on the tract of land in Honolulu known as Kewalo-uka, which was assigned to this Department by the Government of the Territory of Hawaii. About 50 acres of this tract have been cleared and several small buildings have been erected. The investigations have thus far been confined to studies of a fungus disease which seriously affects taro, and studies of the diseases of poultry. Plans are being made for experiments in horticulture, including both fruits and vegetables, and coffee culture. Cooperative investigations in irrigation will also be undertaken. A brief account of this station will be found on page 85, and a detailed report of the special agent in charge on pages 361–379.

PORTO RICO EXPERIMENT STATION.

The first appropriation ($5,000) for agricultural investigations in Porto Rico was made for the fiscal year ended June 30, 1901, and was used for making a preliminary investigation of the agricultural conditions existing in that island, with special reference to the establishment of an experiment station there. This investigation was in charge of Prof. S. A. Knapp, formerly of the Iowa Agricultural College, and on the basis of his report Congress made a second appropriation ($12,000) for the current fiscal year, which authorized the Secretary of Agriculture to establish and maintain an agricultural experiment station in Porto Rico.

In the spring of 1901 the investigations in Porto Rico were put in charge of Mr. Frank D. Gardner, who has since made his headquarters at San Juan. The work thus far has been largely confined to an agricultural survey of the island with reference to the best locations for experimental investigations. Experiments in coffee culture have, however, recently been undertaken on leased land at Rio Piedras. Studies of injurious insects and plant diseases have also been begun. Improved varieties of seeds and plants have been distributed. A brief account of this station will be found on page 176, and a detailed report of the special agent in charge on pages 381–415.

STATISTICS OF THE STATIONS.

Agricultural experiment stations are now in operation under the act of Congress of March 2, 1887, in all the States and Territories and in Alaska, Hawaii, and Porto Rico. In Connecticut, New Jersey, New York, Hawaii, Missouri, Alabama, and Louisiana separate stations are maintained wholly or in part by State funds. A number of substations are also maintained in different States. Excluding the substations, the total number of stations in the United States is 60. Of these, 54 receive appropriations provided for by act of Congress.

The total income of the stations during 1901 was $1,231,881.55, of which $720,000 was received from the National Government, the remainder, $511,881.55, coming from the following sources: State governments, $290,305.95; individuals and communities, $1,580.59; fees for analyses of fertilizers, $82,322.40; sales of farm products, $93,363.98; miscellaneous, $44,308.63. In addition to this, the Office of Experiment Stations had an appropriation of $125,000 for the past fiscal year, including $12,000 for the Alaska experiment stations, $10,000 for the Hawaiian investigations, $5,000 for the Porto Rican investigations, $15,000 for nutrition investigations, and $50,000 for irrigation investigations. The value of additions to the equipment of the stations in 1901 is estimated as follows: Buildings, $133,420.77; libraries, $26,303.49; apparatus, $15,309.48; farm implements, $13,085.45; live stock, $18,220.29; miscellaneous, $25,025.10; total, $231,364.58.

The stations employ 688 persons in the work of administration and inquiry. The number of officers engaged in the different lines of work is as follows: Directors, 52; assistants and vice-directors, 17; chemists, 146; agriculturists, 62; animal husbandmen, 14; horticulturists, 78; farm foremen, 21; dairymen, 31; botanists, 49; entomologists, 48; zoologists, 6; veterinarians, 29; meteorologists, 14; biologists, 7; physicists, 5; geologists, 5; mycologists and bacteriologists, 21; irrigation engineers, 8; in charge of substations, 12; secretaries and treasurers, 29; librarians, 11; and clerks and stenographers, 40. There are also 77 persons classified under the head of "miscellaneous," including

superintendents of gardens, grounds, and buildings, apiarists; vegetable, plant, and animal pathologists; herdsmen, poultrymen, etc.

Three hundred and twenty-five station officers do more or less teaching in the colleges with which the stations are connected.

The activity and success of the stations in bringing the results of their work before the public continue unabated. During the year they published 445 annual reports and bulletins, which are many more than are required by the Hatch Act. These were supplied to over half a million addresses on the regular mailing lists. A larger number of stations than formerly supplemented their regular publications with more or less frequent issues of press bulletins, and most of the stations report a large and constantly increasing correspondence with farmers on a wide variety of topics.

FOREIGN EXPERIMENT STATIONS.

Instances of governmental activity for the advancement of agriculture in other countries are numerous, both in the Old World and the New.

The Russian Department of Agriculture and Imperial Domains has inaugurated a system of commissioners of agriculture who will correspond in a general way to our commissioners of agriculture or to our secretaries of State boards of agriculture. Each commissioner's office will have connected with it a corps of agricultural specialists, who will work among the landowners and peasants. The Russian Department of Agriculture and Imperial Domains is also displaying considerable activity in its soil and forestry investigations and in the establishment of stations for the investigation of special subjects, such as the growing of flax, cotton, olives, etc.

In Australia the Victoria Department of Agriculture is undergoing reorganization. The Victoria Royal Commission on Technical Education has brought to a close its study of Australian, European, and American departments of agriculture, agricultural schools, and experiment stations, and published its final (sixth) report. The Minister of Agriculture is now seeking a director of agriculture, who will proceed to reorganize the Department and put it on a better working basis

In England the Board of Agriculture has made larger grants than formerly to agricultural colleges and societies for conducting agricultural investigations. The Agricultural Education Committee is doing important work for agriculture and agricultural education by publishing circulars on various topics and nature-study leaflets for teachers. During the year Mr. John S. Remington has established the Aynsome Experiment Station at Lancashire, a private institution.

The Austrian Government has recently established several experiment stations, notably the station for plant culture at Brünn, the

station for investigations in plant and animal production at Otterbach, and an agricultural physiological station, with divisions of chemistry, physiology, and bacteriology, at Prague. In Hungary an experiment station for the analysis and study of wines was established last year at Fiune.

France has established at Nogent-sur-Marne a colonial garden to have administrative control over French colonial stations and botanic gardens in different parts of the world and to furnish these institutions with seeds and plants. During the year œnological stations have been established at Toulouse and Beaune and an agricultural station at Besançon.

In Germany five years of successful work at the Lauchstadt Experimental Farm, which is connected with the Agricultural Chemical Experiment Station at Halle, has given so much evidence of the value of experimental farms in connection with experiment stations that there is a movement in that country toward the extension of the so-called "American system" of field experiments, conducted on a large scale and in a more practical way than has hitherto been customary in that country. Two new stations have been established during the year, a flax-culture station at Sorau and a viticultural experiment station at Weinsberg.

In the West Indies and South America also the claims of agricultural education and research have received much attention. The Department of Agriculture in the West Indies has established three new stations at Montserrat and one at Tortola, and has conducted several meetings of planters and investigators, at which great interest in the advancement of agriculture was displayed. The Bolivian Government has established an agricultural college at Cochabamba and an agricultural school for Indians at Umala. Brazil has recently established a botanical garden and experimental demonstration field at San Vicente, and Argentina has decided to establish four experiment stations on the same general plan as those in the United States.

A review of the agricultural progress of the year would not be complete without mention of the organization of a department of agriculture, with a small staff of experts, at Bangalore by the government of Mysore, India; the establishment of a dairy station at Gembloux, Belgium; a veterinary pathological institute and animal vaccine institute at Christiania, Norway; and an irrigation experiment station at Calgary, Canada.

THE ASSOCIATION OF AMERICAN AGRICULTURAL COLLEGES AND EXPERIMENT STATIONS.

OFFICERS.

President,

W. M. LIGGETT, of Minnesota.

Vice-Presidents,

W. O. THOMPSON, of Ohio.
J. H. WASHBURN, of Rhode Island.
H. J. WATERS, of Missouri.
J. H. WORST, of North Dakota.
J. C. HARDY, of Mississippi.

Secretary and Treasurer,

E. B. VOORHEES, of New Jersey.

Bibliographer,

A. C. TRUE, of Washington, D. C.

Executive Committee,

H. H. GOODELL, of Massachusetts, *Chairman.*
ALEXIS COPE, of Ohio.
G. W. ATHERTON, of Pennsylvania.
H. C. WHITE, of Georgia.
Ex officio, the PRESIDENT; the JUNIOR EX-PRESIDENT (A. W. HARRIS); the SECRETARY.

FIFTEENTH ANNUAL CONVENTION.

The fifteenth annual convention of the Association of American Agricultural Colleges and Experiment Stations was held at Washington, D. C., November 12–14, 1901. President A. W. Harris, of the University of Maine, presided at the general sessions and delivered the president's annual address. This address set forth clearly the more important things for which the land-grant colleges stand and summarized the results of their work. The land-grant act of 1862, was considered important not only as providing for agricultural education, but as the first sufficient recognition of study and investigation as the basis of the best success in the arts and industries. It also proclaimed the duty of the National Government to promote industrial education, and in its results demonstrated the effectiveness of governmental cooperation. The most important of the direct results of this act to agricultural colleges was the experiment station. "If the agricultural college did nothing more than to establish, maintain, and officer the experiment station, it would be justified many times over." The establishment of the agricultural colleges also caused the strengthening and broadening of industrial education along all lines and has culminated in a great system of technical education. "It is also a great result of the land-grant college to have asserted and established the doctrine

that education in all its forms, from the lowest to the highest, is a State function, in which the State has the fullest rights and for which it must bear the responsibility, sharing the privilege and responsibility with private corporations only as it thinks best." The speaker considered State aid and control in higher education as necessary to the best national development, and especially so because in this way the results of higher education become the property of all the people. The address concluded with an eloquent tribute to the memory and worth of Justin S. Morrill.

The report of the executive committee presented by its chairman, President H. H. Goodell, of the Massachusetts Agricultural College, called the attention of the association to the fact that the bill for the establishment of schools or departments of mining and metallurgy in connection with the land-grant colleges passed the Senate, but failed to be called up in the House of Representatives during the last session of Congress. The introduction of a similar bill into Congress early next session was recommended.

The report of the committee on revision of the constitution called forth a vigorous discussion. The association refused to change its name. Among the important amendments adopted were those providing that the election of officers shall be by ballot upon nominations made on the floor of the convention, and that the programme of the annual conventions of the association shall hereafter be made up and distributed sixty days before the meeting of the convention; and the subjects provided for consideration by a section of any convention of the association shall concentrate the deliberations of the section upon not more than two main lines of discussion, which lines shall as far as possible be related. Not more than one-third of the working time of any annual convention of the association shall be assigned to miscellaneous business.

The committee on graduate study at Washington reported that no progress had been made since the last convention in securing a Government bureau in Washington for the administration of graduate work. The association directed the committee to continue its efforts in this direction and, in the meantime, to secure if practicable the same opportunities for study and research in other Departments of the Government as are at present afforded graduate students in the Department of Agriculture. A resolution was also adopted by the association recording its appreciation of the action of the Government in making available the facilities for research and advanced work in the Department of Agriculture, and expressing a desire that these facilities may be still further extended and that a national university devoted exclusively to advanced study and graduate and research work be established.

The sixth report of progress was submitted by the committee on

methods of teaching agriculture. Attention was called to the publication by the Department of Agriculture of the syllabi of courses in agrotechny, rural engineering, and rural economics prepared by the committee last year. In surveying the progress of agricultural education in this country during recent years, the committee "found abundant evidence that the attitude of this association and the work of this committee as its representative have already borne good fruit in stimulating and aiding the movement for the specialization of agricultural instruction in our colleges, the strengthening of agricultural faculties, and the bettering of the material equipment for agricultural education." The committee announced its intention to prepare and publish during the coming year a report on the courses in agronomy in our agricultural colleges and the facilities for instruction in this subject.

The committee on cooperative work between the stations and the Department of Agriculture made the following recommendations as supplementary to those embodied in the report submitted at the last convention: "(1) When cooperation is desired by the station, it is deemed advisable that the proposal for such cooperation be made to the Department by the director of the experiment station. Where, on the other hand, the Department desires the cooperation of the station, it is deemed advisable that the proposal be made in the first instance to the director rather than to members of the staff. (2) While it is well understood that no financial obligations can be undertaken beyond the end of the fiscal year, yet it should be recognized that any arrangement for joint experimentation which requires some years to complete creates a moral obligation upon both parties to carry the work to a conclusion. (3) Where a line of investigation has been in progress in any State under the auspices of either institution, it is, as a rule, unwise for the other party to undertake independently the same line of investigation, at least until after full consultation upon the subject."

The committee was continued with the addition of Prof. B. T. Galloway, of the Department of Agriculture.

The report of the committee on indexing agricultural literature called attention to the fact that progress in this direction could not be made by the Department of Agriculture until its library was provided with funds for this purpose. A paper on agricultural college libraries, prepared and presented by Miss Josephine A. Clark, librarian of the Department of Agriculture, and a member of this committee, completed the report. This paper emphasized the great importance of libraries as aids to the work of investigation and instruction and pointed out the necessity of systematic arrangement and complete cataloguing of agricultural libraries. Arrangements in progress by the library of the Department of Agriculture for assisting agricultural colleges in classifying and cataloguing their libraries were explained.

The report of the bibliographer, A. C. True, noted the work of a bibliographical character being done by the Department of Agriculture, and enumerated with explanatory notes forty-four general and partial bibliographies in lines relating to agriculture issued during the past year.

The general plan of the graduate summer school of agriculture, as proposed by the Ohio State University at the last convention and approved by the executive committee, was explained by President W. O. Thompson of the university. It was stated that sufficient encouragement had been received from the leaders of agricultural education and research to warrant a decision to hold the first session of the school at the Ohio State University at Columbus, Ohio, during the summer of 1902. It was announced that Secretary Wilson had cordially approved the plan for this school, and that, acting under his advice, Dr. A. C. True, Director of the Office of Experiment Stations, had consented to act as dean of the school. The Ohio State University makes itself responsible for the general management of the first session of the school, but if it proves a success it is proposed to make it a cooperative enterprise, to be managed by a committee of control appointed by the association. Future sessions may be held at institutions in different parts of the country. This plan for the school was indorsed by the association, and a prospectus of the first session will soon be issued.

The association voted in favor of exhibits illustrating the progress of instruction and research in agriculture and the mechanic arts at the St. Louis Exposition in 1903, and committees on these exhibits were appointed.

A resolution introduced by Prof. W. A. Henry, of Wisconsin, was adopted by the association, urging upon Congress "the necessity and wisdom of providing a building for the accommodation of the Department of Agriculture which in magnitude shall be sufficient to provide for its future, as well as present needs, and which will properly represent in its architecture the enormous importance of agriculture in this country, and which will constitute a worthy addition to the Government buildings of the capital of the United States."

In the section on college work, a paper on the relation of agricultural colleges to the proposed national university, by President W. O. Thompson, of the Ohio State University, was presented, in which the writer affirmed that in his judgment "the relation of the agricultural colleges to a national university should be that of sympathetic cooperation and enthusiastic support, as against all other measures, whether proposed as substitutes or stepping-stones." This paper called forth a lively discussion, in which it appeared that there was a general sentiment in the section in favor of securing some agency under Government control for making the laboratories, museums, libraries, and other educational facilities in Washington available to advanced students.

W. M. Liggett, dean of the College of Agriculture of the University of Minnesota, read a paper on the value of short courses, in which he described the different courses in agriculture given in Minnesota, and stated that he considered the short courses valuable adjuncts to the longer courses.

Hon. J. H. Brigham, Assistant Secretary of Agriculture, spoke of the short courses as a means not only of giving valuable instruction to farmers, but also of bringing about more cordial relations between the agricultural colleges and farmers. In his judgment "the best way to secure the support of farmers is to let them come to the college, even for a short time, and see that you are trying to do good."

In the section on agriculture and chemistry considerable time was given to a consideration of the question to what extent the Department of Agriculture and the experiment stations may profitably cooperate in the study of grass and forage plant problems, and the lines of work which are likely to yield the most important results. Prof. B. T. Galloway, Chief of the Bureau of Plant Industry, gave a brief history of the cooperative forage-plant work of the Department and the stations. He expressed his opinion that the success of the movement depended on grouping the stations with reference to the problems to be solved in different sections of the country, and devising a working plan for each group. The following lines of work were suggested: (1) The introduction of crops from foreign countries; (2) growing and disseminating introduced crops after they have become in a measure established; (3) dissemination of native crops of local value; (4) breeding crops for certain conditions; and (5) increasing production by improved cultural methods. Prof. R. H. Forbes, director of the Arizona Experiment Station, described the grass and forage crop conditions of that Territory, and gave an account of the cooperative investigations carried on there. These investigations have for their object the improvement of the ranges through the exclusion of live stock, the sowing and harrowing in of seeds of native plants, the introduction of new forage plants suited to the arid region, and the construction of small embankments for holding the storm water. As conducted for two years on a reserve of 350 acres they have given promising results. Prof. F. Lamson-Scribner, Agrostologist of the Department of Agriculture, gave an account of the cooperative work under his direction, which includes arrangements with 17 experiment stations. Among other subjects discussed in this section were the problems of irrigation in humid regions, plant breeding, and artificial plant-food requirements of different soils.

In the report of the section on horticulture and botany the marked strengthening of advanced courses in these subjects in colleges was pointed out. The demand for especially qualified men in horticulture was stated to be greater than the supply. There has recently been

rapid progress in bacterial and physiological investigations and special studies on the selection and breeding of plants. At the meeting of the section papers were presented on the relations of instruction and research in horticulture in the agricultural colleges; cooperation between the farmer and the experiment station; observations concerning the first and second generations of plants; the effect of light and heat on the germination of Kentucky blue grass and on the quality of some commercial samples of grass and clover seed.

The report of the section on entomology presented by Prof. M. V. Slingerland, of the Cornell University Experiment Station, reviewed the progress of entomology during the past year, especially as regards instruction, investigation, and inspection. At the meeting of the section the following papers were read: A year's experience with crude petroleum in New Jersey; Some of the most important insects in Massachusetts; The time of emergence and oviposition of the spring brood of the Hessian fly; Life history of the sugar-cane borer in Louisiana; Florida observations and experimental work; Apple aphids; and A folding fumigator.

The report of the section of mechanic arts was presented by Prof. H. W. Tyler, of the Massachusetts Institute of Technology. This gave at some length the progress of instruction in mechanic arts during the year.

OFFICE OF EXPERIMENT STATIONS.

An Office in the United States Department of Agriculture.

LINES OF WORK.

The work of the Office of Experiment Stations during the past year, as heretofore, has included the supervision of the expenditures of the stations; conferences and correspondence with station officers regarding the management, equipment, and work of the stations; the collection and dissemination of information regarding the progress of agricultural education and research throughout the world by means of technical and popular bulletins; the management of the agricultural experiment stations in Alaska, Hawaii, and Porto Rico. The special investigations on the nutrition of man and on irrigation assigned to this Office have been conducted on a larger scale than formerly, largely in cooperation with experiment stations, educational institutions, and other agencies in different States and Territories. The Office also did considerable work in connection with the collective experiment-station exhibit at the Paris and Buffalo expositions.

INCOME.

The income of the Office during the past fiscal year, derived wholly from appropriations by Congress, was as follows:

For the general business of the Office	$33,000
For the Alaska experiment stations	12,000
For the Hawaii experiment station	10,000
For the Porto Rico experiment station	5,000
For nutrition investigations	15,000
For irrigation investigations	50,000
Total	125,000

PUBLICATIONS.

During the year the Office issued 52 documents, aggregating 3,843 pages. These include 14 numbers of the Experiment Station Record, with detailed index, 18 bulletins, 5 farmers' bulletins, 1 report, 2 Congressional documents, 3 circulars, 3 articles for the Yearbook of the Department, and 6 special articles published as separates.

Experiment Station Record, Vol. XII, pp. 1189.—This contains abstracts of 348 bulletins and 55 annual reports of experiment stations in the United States, 158 publications of the Department of Agriculture, and 1,675 reports of foreign investigations. The total number of pages in these publications is 31,268. The total number of articles abstracted is 3,271, classified as follows: Chemistry, 172; botany, 158; fermentation and bacteriology, 38; zoology, 31; meteorology, 99; air, water, and soils, 135; fertilizers, 139; field crops, 353; horticulture, 320; forestry, 130; seeds and weeds, 80; diseases of plants, 248; entomology, 334; foods and animal production, 314; dairy farming and dairying, 181; veterinary science, 347; technology, 25; agricultural engineering, 56; statistics and miscellaneous, 121.

Special articles were also published in this volume of the Record as follows: Notes on horse feeding; New agricultural building at Kansas State Agricultural College; International congresses of horticulture, viticulture, and agriculture at Paris; New building for the College of Agriculture at the University of Illinois, and Russian soil investigations.

There are condensed accounts of the Proceedings of the Fourteenth Annual Convention of the Association of American Agricultural Colleges and Experiment Stations, and of the Seventeenth Annual Convention of the Association of Official Agricultural Chemists, 1900; and, in addition, editorial discussions of the following topics: The promotion of agriculture in Russia, agricultural experiment stations for Hawaii and Porto Rico, international congresses of agricultural experiment stations and of agricultural education at Paris, the late Sir John Bennet Lawes, the influence of the Rothamsted experiment station, experiment-station exhibits at the Paris Exposition, need of more perfect organization of the experiment stations, differentiation of the investigator from the teacher, some recent bibliographic helps, protection of crops from hail, the scope and management of the veterinary work of the experiment stations, investigation of soils in Russia, variety testing at Woburn Experimental Fruit Farm, cheese curing in the light of the enzym theory, the agricultural appropriation act, experiment station farms and the movement for their establishment in Germany, the Hawaii experiment station, and Maxime Cornu, botanist, horticulturist, and agriculturist.

MISCELLANEOUS TECHNICAL BULLETINS.

Bulletin 88, pp. 181.—Organization Lists of the Agricultural Colleges and Experiment Stations in the United States, with a List of Agricultural Experiment Stations in Foreign Countries.—This contains a list of the officers of the Association of Agricultural Colleges and Experiment Stations and of the Association of Official Agricultural Chemists; a list of institutions having courses in agriculture in the United States,

with courses of study and boards of instruction; a list of experiment stations in the United States, with governing boards and station staffs; a list of experiment stations in sixty-seven foreign countries, with their location and directors; a list of station publications received by the Office of Experiment Stations during 1900; Federal legislation affecting agricultural colleges and experiment stations, and regulations and rulings of the Federal departments affecting the stations. The bulletin contains a complete index of names.

Bulletin 93, pp. 181.—A Report on the Work and Expenditures of the Agricultural Experiment Stations for the year ended June 30, 1900.—This contains the report of the Director of this Office as transmitted to Congress.

Bulletin 94, pp. 83.—Fourth Report on the Agricultural Investigations in Alaska, 1900.—This contains the report of the special agent in charge of Alaska investigations.

Bulletin 95, pp. 100.—Report on the Agricultural Resources and Capabilities of Hawaii.—This contains a report of a preliminary investigation of agricultural conditions in Hawaii, with special reference to the establishment of an agricultural experiment station in that Territory, by Dr. William C. Stubbs, director of the Louisiana Agricultural Experiment Stations.

Bulletin 97, pp. 37.—Statistics of the Land-Grant Colleges and Agricultural Experiment Stations in the United States for the year ended June 30, 1900.—Shows the number of officers and students, endowment, equipment, and revenue of the colleges, and the number of officers, revenues, expenditures, lines of work, additions to equipment during the year, and number of publications of the stations.

House Doc. 171, Fifty-sixth Congress, second session, pp. 32.—Agricultural Resources and Capabilities of Porto Rico.—A report by Prof. S. A. Knapp on investigations of the agricultural resources and capabilities of Porto Rico, with special reference to the establishment of an agricultural experiment station in that island. The report discusses the climate, soils, and industrial conditions of the island; the agricultural and horticultural products, especial attention being given to the sugar, coffee, and tobacco industries; the character of labor and farm wages; the agricultural depression, and the possibilities of agriculture in that island, and makes recommendations regarding agricultural investigations.

Bulletin 99, pp. 192.—Proceedings of the Fourteenth Annual Convention of the Association of American Agricultural Colleges and Experiment Stations, held at New Haven and Middletown, Conn., November 13–15, 1900.—Contains in addition to the proceedings of the convention, papers, addresses, and reports on a number of subjects of interest to students and investigators in agricultural science.

Yearbook of the Department of Agriculture, 1900, pp. 115–130.—Agricultural Education in France.—Describes the system of agricultural education in that country.

Card Index of Experiment Station Literature.—Copy for 1,900 cards was prepared during the past year. The number of cards distributed has reached 21,500.

FARMERS' BULLETINS.

Farmers' Bulletin 121, pp. 22.—Beans, Peas, and Other Legumes as Food.—Beans, peas, lentils, and other legumes used fresh or dried as articles of diet are described, and their food value as compared with other vegetables and with animal foods is discussed. The principles which govern the cooking of leguminous vegetables are treated, and statistics are given of the use of such foods and their importance in the diet.

Farmers' Bulletin 128, pp. 32.—Eggs and Their Uses as Food.—Describes different kinds of eggs used for food, and summarizes the available information regarding their composition and uses and value as articles of diet.

Farmers' Bulletins 122, 124.—Experiment Station Work XVI, XVII.—The two numbers prepared during the past year of the subseries of brief popular bulletins compiled from the published reports of the agricultural experiment stations and kindred institutions in this and other countries.

AGRICULTURAL EXPERIMENT STATIONS IN ALASKA, HAWAII, AND PORTO RICO.

For accounts of the work of the stations in Alaska, Hawaii, and Porto Rico during the past year, see pages 54, 85, and 176.

NUTRITION INVESTIGATIONS.

The nutrition investigations the past year may be divided into four general classes: (1) Dietary studies; (2) digestion experiments; (3) cooking experiments; (4) metabolism experiments.

The dietary studies have been conducted in various parts of the United States, and have included the study of the diet of people of varying ages and occupations under different conditions. They furnish a considerable amount of data as to the actual food habits of persons in different parts of the country, give opportunity for comparison with the data obtained in other countries, and aid in establishing a general nutrition standard.

The digestion experiments have also been conducted in different parts of the country under widely varying conditions. By means of these experiments the digestibility of various classes of food materials, like meats, cereals, legumes, fruits, nuts, etc., is studied, and data are

obtained as to the amount of the food material consumed which is made available for use in the human body.

The cooking experiments have been made with meat, and have included the study of the effects of different methods of cooking upon the meat with reference to composition, digestibility, nutritive value, and pecuniary economy.

The metabolism experiments have been conducted with the aid of the respiration calorimeter. In these experiments the income and outgo of the body were carefully observed under different conditions of rest and work. The questions especially considered this year were (1) the relation between muscular work and the metabolism of nitrogen, and (2) the relative efficiency of fats and carbohydrates in the diet for severe muscular work. The results obtained have been unusually interesting and valuable.

All these experiments include a large amount of analytical work, as well as the determination of a considerable number of heats of combustion by means of the bomb calorimeter.

Considerable editorial work is also required to put the results of the investigations in form for publication as either technical or popular bulletins. The amount of editorial work has been somewhat larger this year than usual.

The nutrition investigations were carried on in cooperation with colleges and experiment stations in Connecticut, Massachusetts, Maine, New York, Tennessee, Illinois, Minnesota, and California.

Five technical bulletins, two farmers' bulletins, a yearbook article, and two circulars on subjects relating to the food and nutrition of man were issued during the past year's as follows:

Bulletin 84, pp. 39.—Nutrition Investigations at the California Agricultural Experiment Station, 1896–1898.—Reports four dietary studies of infants, one of the university football team during training, and one of a chemist's family; also digestion experiments with an infant on a milk diet, as well as a metabolism experiment in which the balance of income and outgo of nitrogen was determined.

Bulletin 85, pp. 51.—A Report of Investigations on the Digestibility and Nutritive Value of Bread.—This bulletin is a progress report, giving the results of experiments with men on the digestibility of bread of various kinds when eaten alone, and when forming a part of a simple mixed diet; artificial digestion experiments with the same sorts of bread; a test of skim milk *v.* water for use in mixing dough; and studies of the loss of nutrients in bread making and of methods of determining metabolic nitrogen.

Bulletin 89, pp. 77.—Experiments on the Effect of Muscular Work upon the Digestibility of Food and the Metabolism of Nitrogen.—This is a report on 16 experiments with men, undertaken for the purpose of studying the effect of muscular work upon the digestibility of a

simple mixed diet, and upon the metabolism of nitrogen, with numerous analyses of the food materials used in the experiments.

Bulletin 91, pp. 42.—Nutrition Investigations at the University of Illinois, North Dakota Agricultural College, and Lake Erie College, Ohio, 1896–1900.—This bulletin reports the results of a study of the diet of a teacher's family and of a *mechanics'* boarding club at the University of Illinois, Champaign, Ill.; of a club of women students at the North Dakota Agricultural College, Fargo, N. Dak.; and of the faculty and students at the college commons of Lake Erie College, Painesville, Ohio, including numerous analyses of the food materials used.

Bulletin 98, pp. 67.—The Effect of Severe and Prolonged Muscular Work on Food Consumption, Digestion, and Metabolism and the Mechanical Work and Efficiency of Bicyclers.—This bulletin reviews previous investigations on this subject, and reports studies of the food consumption, digestion, and metabolism of three of the contestants in a six-day bicycle race at Madison Square Garden, New York, with a critical discussion by the professor of experimental engineering of Cornell University of the mechanical work and efficiency of bicyclers based upon data secured in these studies.

Farmers' Bulletin 121, pp. 32.—Beans, Peas, and Other Legumes as Food.—For note on this bulletin see page 45.

Farmers' Bulletin 128, pp. 32.—Eggs and Their Uses as Food.—This bulletin is noted on page 45.

Yearbook of the Department of Agriculture, 1900, pp. 337–348.—The Value of Potatoes as Food.—Summarizes the available information on this subject.

IRRIGATION INVESTIGATIONS.

The irrigation investigations conducted under the direction of this Office have pursued the same general lines as heretofore, the work having been extended to meet the growing demand for information on this subject as far as the appropriation would permit.

As far as practicable, arrangements have been made to cooperate with other agencies engaged in the study of irrigation questions. These cooperative efforts include the agricultural colleges and experiment stations of California, Washington, Montana, Idaho, Nevada, Utah, Wyoming, Nebraska, Texas, Arizona, and New Mexico in the arid region, and Wisconsin, Missouri, North Dakota, and New Jersey in the humid region. The different State irrigation offices are also being aided in the study of questions for which the States do not provide sufficient means. The cooperation with the State engineers' offices includes Nebraska, Colorado, Wyoming, Utah, and Idaho, all of the arid States in which such offices have been established.

In accordance with the terms of the act creating this investigation,

it has continued to follow two distinct lines, (1) to study the laws and institutions of the different States relating to the ownership and distribution of the public water supplies, and (2) to assist the irrigators under ditches already built and the managers of the canals which supply the farms now irrigated in the improvement of methods of distributing and using water in order that the land now cultivated by irrigation may be rendered more valuable, the controversies over water rights lessened, and its economical use promoted.

Under the first division the investigation began by a study of the laws and customs governing the ownership and use of a single stream. It has been found desirable to modify this plan by taking up in turn the laws governing rights to water in a single State, as in this way the people of that State can better understand the merits and defects of the irrigation laws now in force and the measures necessary to avert the evils which have arisen under these laws or to promote development by their modification. The report on irrigation in California is the first of these special studies of State laws. The reports of the eight experts engaged in this investigation give the most exhaustive description of irrigation conditions yet published of any State. In addition, it contains a general review of the agricultural situation and possibilities of California, written by the expert in charge and based on his personal studies. A similar investigation is now being carried on in Utah.

The studies of the operation of the Colorado laws have been continued under the direction of Hon. A. J. McCune, State engineer.

The measurements of the water used in irrigation for the past season embraced a much wider area, a better equipment, and more satisfactory results than those of the previous year. Stations for this purpose have been maintained in 16 States and Territories.

The designing of instruments for measuring and recording the water used in irrigation has continued. Two new designs for water registers were furnished to irrigators and canal companies last year. The latest of these designs can be furnished irrigators at about one-half the cost of the foreign instruments formerly used.

This investigation has also secured the interest and cooperation of a large number of irrigation engineers and managers of canal companies in a series of measurements to determine the coefficient of friction in canals and laterals, especially the latter, data for the accurate determination of the flow of small ditches being very much needed.

The studies of the amount and character of the sediment carried by streams used in irrigation and its influence, beneficial or otherwise, on the land where applied has been continued.

Six technical bulletins, one Farmers' Bulletin, a Yearbook article, and a circular on irrigation have been prepared for publication during the year.

Bulletin 86, pp. 253.—The Use of Water in Irrigation.—Report of investigations made in 1899. This bulletin explains the methods in use in the arid States in the distribution and use of water in irrigation. It gives a large number of measurements made to determine the duty of water and the losses by seepage and evaporation from canals, and discusses the methods by which the water supply may be more effectively and economically utilized in the production of crops.

Bulletin 87, pp. 40.—Irrigation in New Jersey.—This bulletin gives the results of a number of experiments on different kinds of small fruits, melons, and vegetables during 1898 and 1899, made for the purpose of determining whether irrigation during short periods of drought in regions where the rainfall is usually sufficient for the maximum growth of crops will sufficiently increase the yield to pay for the works necessary to obtain the supply of water, and reports observations on the construction and cost of six small irrigation plants in New Jersey.

Bulletin 90, pp. 48.—Irrigation in Hawaii.—Discusses the climatic, soil, and other conditions as affecting irrigation in Hawaii, and gives the results of irrigation experiments, especially with sugar cane, carried on by the author for a number of years.

Bulletin 92, pp. 48.—The Reservoir System of the Cache la Poudre Valley.—Contains a description of the reservoir system of the Cache la Poudre Valley, showing the benefits to be derived from the construction of reservoirs for the storage of water for irrigation.

Bulletin 96, pp. 90.—Irrigation Laws of the Northwest Territories of Canada and Wyoming.—Includes texts of the irrigation laws of the northwest territories of Canada and of Wyoming, with the regulations, forms, and methods of procedure adopted in the administration of these laws, and discussion of the principles underlying the laws and the methods followed in their enforcement.

Senate Doc. 108, Fifty-sixth Congress, second session, pp. 73.—This is an abridged preliminary report on investigations in California.

Yearbook of the Department of Agriculture, 1900, pp. 491–512.—Practical Irrigation.—Gives simple directions for the use of the individual farmer.

THE AGRICULTURAL EXPERIMENT STATIONS IN THE SEVERAL STATES AND TERRITORIES.

ALABAMA.

Agricultural Experiment Station of the Alabama Polytechnic Institute, *Auburn.*

Department of the Alabama Polytechnic Institute.

GOVERNING BOARD.

Board of Trustees—Committee on Experiment Stations: Thomas Williams, *President, Wetumpka;* Jonathan Haralson, *Selma.*

STATION STAFF.

———— ————, *President of the College and of the Station Council.*

P. H. Mell, M. E., PH. D., *Dir.; Bot.*
B. B. Ross, M. S., *Chem.*
C. A. Cary, B. S., D. V. M., *Vet.*
J. F. Duggar, M. S., *Agr.*
E. M. Wilcox, PH. D., *Biol.*
J. T. Anderson, PH. D., *Assoc. Chem.*
C. L. Hare, M. S., *1st Asst. Chem.*
Thomas Bragg, B. S., *2d Asst. Chem.*
J. C. Phelps, B. S., *3d Asst. Chem.*
T. U. Culver, *Supt. Farm.*
R. W. Clark, *Asst. in Agr.*
C. F. Austin, *Asst. Hort.*
G. F. Freeman, *Sec.*

LINES OF WORK.

Work at the Alabama Station during the past year has been continued along lines of economical soil improvement, including experiments with commercial fertilizers, stable manure, and green manuring crops for the purpose of studying their respective values in raising cotton, corn, oats, and wheat; animal production and dairying with closely associated studies of animal diseases and experiments with silage and forage crops, especially sorghum, cowpeas, rye, vetch, and native grasses; and plant production, including, besides the experiments with field crops mentioned above, experiments with vegetables and orchard and small fruits, studies of plant diseases, irrigation experiments with garden vegetables, and experiments in cooperation with the Bureau of Plant Industry of this Department on hybrid oranges and tea plants. The agricultural and chemical departments have continued to cooperate in the study of the fixation of atmospheric nitrogen by legumes. The station is cooperating with the Bureau of Chemistry of this Department in studies on methods of potash analysis.

Most of the station work has been in progress several years and will be continued. The work of the agricultural department in ani-

mal industry and dairying is being extended; experiments in feeding calves have been started; feeding and grazing experiments with pigs and dairy cows are being continued, and records are being kept of the growth made on pasturage by a large number of common cattle and of the cost of maintaining a small station herd of beef cattle. A study of the fertilizer requirements of cotton on most of the typical soils of the State has been inaugurated. The veterinarian is continuing studies of infectious cerebritis, the toxic effect of cotton seed and cotton-seed meal, and the inoculation of cattle for Texas fever. The Texas-fever investigations at present are for the purpose of determining whether young stock are more immune than old, and whether native stock is born immune. The tests of native trees, the experiments with grasses and those for the improvement of cotton will be continued by the botanist. In connection with the biological survey, work on the fungi occurring in the State has been continued, as have also studies of the bacterial rot of tomatoes and two bacterial diseases of the cabbage. The veterinary department has a new brick building for dissecting purposes, and the chemical department is established in its new laboratory. The director of the station has recently published a revised and enlarged edition of Gardening for the South, by W. N. White. At the end of the year the horticulturist and biologist resigned to accept a position as specialist on fungi in the Botanical Garden in New York City, and was succeeded by Dr. E. M. Wilcox, of the Oklahoma college and station.

INCOME.

The income of the station during the past fiscal year was as follows:

United States appropriation	$15,000.00
Fees for the analysis of fertilizers	8,741.95
Farm products	895.37
Total	24,637.32

A report of the receipts and expenditures for the United States fund has been rendered in accordance with the schedules prescribed by this Department, and has been approved.

PUBLICATIONS.

The publications of this station received during the past fiscal year were Bulletins 109–113, Index to Volume 8, and the Annual Report for 1900.

Bulletin 109, pp. 15.—Strawberries.—Descriptive notes and cultural data are given on 34 varieties grown at the station, with suggestions regarding the establishment of a strawberry plantation.

Bulletin 110, pp. 39, figs. 2.—Grapes.—A general discussion of the culture of grapes under the headings of soils and planting, training

and pruning, cultivation, marketing, and insects and diseases, with brief descriptive notes on 94 varieties of grapes grown at the station.

Bulletin 111, pp. 62, fig. 1.—Corn Culture.—Details and results of variety, fertilizer, seed, and culture experiments with corn carried on at the station during several seasons, are presented in tables and discussed.

Bulletin 112, pp. 36.—Orchard Notes.—Notes and tabulated data are given on the behavior of apples, figs, kaki or Japanese persimmons, hybrid oranges, peaches, pears, and plums grown at the station during the season. Mention is also made of experiments in spraying trees with kerosene oil and with crude petroleum for controlling the San José scale.

Bulletin 113, pp. 52.—Cooperative Experiments with Cotton in 1899–1900.—Data for 37 cooperative soil tests made in 1899 and 1900 in different localities of the State, of which 23 gave definite results, are presented in tables and discussed.

Index to Volume 8, pp. 15.—An index to Bulletins 108–112 and the Annual Report for 1900.

Annual Report, 1900, pp. 20.—A financial statement for the fiscal year ended June 30, 1900, and reports of the director and heads of departments reviewing the different lines of station work.

GENERAL OUTLOOK.

The work of the Alabama Station is planned with full recognition of the fact that the problem of foremost importance in that State is the restoration and maintenance of soil fertility. All other problems taken up are either subsidiary to this or are concerned with the development of diversified agriculture, which must be introduced in order to avoid a repetition of the fertility-exhausting practice of growing cotton year after year on the same land. Cotton is still the important crop of the State, and work in testing, classifying, and improving varieties and in determining its fertilizer requirements is being done, but at the same time other lines of agricultural production, such as dairying, beef and pork production, fruit growing, and vegetable gardening, are being developed. Among the results of the year may be mentioned the successful production of cabbage, cauliflower, and other vegetables under irrigation, and the discovery of means for avoiding the bitter taste imparted to cream by cows that have eaten bitterweed (*Helenium tenuifolium*). The experiments with varieties of grapes have shown that the Herbemont and the Rulander are resistant to root diseases. During the year twenty-two farmers' institutes were held under the direction of the veterinarian, who was aided by five other members of the college and station staff. The institutes were better attended than those held last year and were supported by an appropriation of $500 from the fertilizer tax.

Canebrake Agricultural Experiment Station, *Uniontown.*

GOVERNING BOARD.

Board of Control: R. R. Poole (*Commissioner of Agriculture, ex officio*), *Montgomery;* J. Huggins, *Newbern;* A. Sledge, *Whitsett;* G. D. Stollenwerck, *Uniontown;* M. Walker, *Faunsdale;* W. M. Munford, *Uniontown.*

STATION STAFF.

J. M. Richeson, *Dir. and Sec.* J. F. Connor, D. V. M., *Vet.*
M. Walker, *Treas.*

LINES OF WORK.

The work of the Canebrake Station during the past year has been along the same lines as heretofore, including investigations for the improvement of the impoverished soils of the prairie region; field experiments with cotton, corn, wheat, forage crops, fruits, and vegetables; experiments in floriculture; and studies of diseases of plants and animals.

INCOME.

The income of the station during the past fiscal year was as follows:

State appropriation	$2,500.00
Farm products	370.36
Balance from previous year	1,535.87
Total	4,406.23

No publications have been issued by the station during the past year.

Tuskegee Agricultural Experiment Station, *Tuskegee.*

Department of the Tuskegee Normal and Industrial Institute.

GOVERNING BOARD.

Board of Regents: I. F. Culver, *Montgomery;* Geo. W. Campbell, *Tuskegee;* Chas. W. Hare, *Tuskegee;* Lewis Adams, *Tuskegee;* Booker T. Washington, *Tuskegee;* Warren Logan, *Tuskegee.*

STATION STAFF.

Booker T. Washington, *Principal of the Institute.*
George W. Carver, *Dir.*
Chas. W. Greene, *Manager Home Farm.*
Geo. W. Owens, *In Charge of Dairy Herd.*
William J. Claytor, *Stock Raising.*
Byrd T. Crawford, *Dairying.*
L. J. Watkins, *Floriculture and Landscape Gardening.*
W. C. Smith, *Floriculture and Landscape Gardening.*
F. H. Cordozo, *Hort.*
J. C. Banks, *Sten.*
C. J. Calloway, *In Charge of Agr. Extension Work.*

LINES OF WORK.

The work of the Tuskegee Station during the past year has included cultural and fertilizer experiments with clovers, grasses, corn, sweet

and Irish potatoes, cotton, cabbage, cassava, peas, beans, etc.; feeding experiments with concentrated feeding stuffs, bran, cotton-seed meal, acorns *v.* corn, etc.

INCOME.

The income of the station during the past fiscal year was as follows:

State appropriation..... $1,500

PUBLICATIONS.

The publication of this station received during the past fiscal year was Bulletin 4.

Bulletin 4, pp. 8.—Some Cercosporæ of Macon County, Alabama.—A list of 74 species of Cercosporæ, together with notes on their occurrence.

GENERAL OUTLOOK.

The Tuskegee Station has continued field and feeding experiments of a nature that will be of immediate practical benefit to the colored people of the South who come in contact with the work. Once a month the staff conducts a farmers' conference, where problems relating to the farm, stock, garden, orchard, and kindred subjects are discussed by the staff and by farmers, who come often a distance of 15 miles. The station also issues nature-study leaflets to teachers who will use them and keep up children's gardens in connection with their schools.

ALASKA.

Alaska Agricultural Experiment Stations, *Sitka, Kenai, and Rampart.*

Under the supervision of A. C. True, Director Office of Experiment Stations, United States Department of Agriculture.

STATION STAFF.

C. C. Georgeson, M. S., *Special Agent in Charge, Sitka.*
F. E. Rader, *Asst. at Sitka.*
Hans P. Nielsen, *Asst. at Kenai.*
———— ————, *Asst. at Rampart.*

LINES OF WORK.

The work in Alaska during the past year has included experiments in growing winter rye, spring wheat, barley, oats, buckwheat, and many kinds of hardy vegetables, such as potatoes, turnips, and cabbages; fertilizer experiments, especially with seaweed and fish guano; experiments in making and storing hay; and further investigations of the agricultural possibilities of the interior of Alaska. Regular stations were maintained at Sitka and Kenai in Cook Inlet and experiments were begun on the reservation at Rampart in the Yukon Valley.

Meteorological observations were made at a number of places, as heretofore, in cooperation with the Weather Bureau of this Department. Soil and temperature records were made at Sitka, Kenai, Eagle, Fort Yukon, and Rampart. During the year a two-story barn, 25 by 50 feet, has been built on the station farm at Sitka, to furnish stable room for oxen and storage for hay and implements. A four-room cottage, 1½ stories high, was also erected here for the use of the assistant. On Castle Hill, the site of the station building, a water tank has been built to provide a water supply and fire protection for the building. During the last few weeks of the year the special agent in charge of the Alaska stations made a trip of inspection to the Kenai Station and later a similar trip to the reservation at Rampart.

INCOME.

The appropriation for the Alaska investigations for the fiscal year ended June 30, 1901, was $12,000.

PUBLICATIONS.

The fifth report on the investigations in Alaska, giving a detailed account of the operations during the year 1901, has been prepared by the special agent in charge of Alaska investigations, and is given on pages 239–359 of this bulletin.

GENERAL OUTLOOK.

At the Sitka Station, winter rye, spring wheat, barley, oats, and buckwheat matured both in 1900 and in 1901. Seaweed proved to be an excellent manure, especially for potatoes, and fish guano manufactured at Killisnoo, Alaska, was also effective as a fertilizer. Repeated tests of new ground have shown that it is very generally unproductive, requiring two or three years of thorough cultivation to make it productive.

At Kenai experiments with grains and vegetables similar to those at Sitka were partly successful. Early varieties matured, but late varieties were only partly matured when frost came. About 6 tons of hay were cut and successfully cured on natural meadows at a distance of about 6 miles from the station. The improvements at this place now include a good 2-story log house and about 8 acres of cleared land. Clearing is not very difficult in this locality, nor is the land so difficult to subdue as in other places.

In the summer of 1900 a reservation of 320 acres for experimental purposes was made at Rampart, on the Yukon River, and work was begun on this reservation in August of the same year. Winter rye

sown that month wintered perfectly and matured by August 1, 1901. Barley sown in the spring matured by the middle of August.

The results of the past year have given additional evidence that quite a number of hardy vegetables and cereals can be successfully matured in Alaska. In gardening especially there is abundant evidence at Sitka, Kenai, and other points that a gratifying amount of educational and demonstration work has been done among the people. A number of private residences in Sitka show well-directed industry in beautifying their surroundings and in maintaining creditable home gardens. Many of the natives here and at Kenai plant gardens of vegetables and flowers, some of which are well cared for and objects of pride. These gardens contain lettuce, radishes, cabbages, peas, potatoes, and other hardy vegetables; and flower beds of sweet peas, pansies, and a number of other flowers are not uncommon. The seed for planting these gardens and the directions and encouragement in maintaining them have come very largely from the special agent in charge of the Alaska stations and his assistants, whose work is becoming well and favorably known in the Territory.

Fruit growing and animal production have not yet received much attention in Alaska, and it seems desirable to undertake some work along these lines. The station has many calls for nursery stock, and some experiments in testing varieties, methods of propagation, and management should be undertaken. The demand for fresh beef and dairy products and the high freight rates on these articles when shipped in make it desirable that experiments with cattle be undertaken in connection with the experiments with cereals and forage crops. Cattle can be pastured from June to October, or even longer, and natural meadows in some localities will furnish an abundant supply of good hay. The Swedish missionary at Yakutat raises cattle which he pastures on an island where they graze until December. There is a meadow near the shore not far from his place where he cuts grass for his silo. The silage keeps well and the cattle prefer it to hay. The raising of poultry and hogs and of feeds for them are other lines of work that might well be taken up in the future.

ARIZONA.

Agricultural Experiment Station of the University of Arizona, *Tucson.*

Department of the University of Arizona.

GOVERNING BOARD.

Board of Regents: William Herring (*Chancellor*), *Tucson;* J. A. Zabriskie (*Sec.*), *Tucson;* H. B. Tenney (*Treas.*), *Tucson;* A. V. Grossetta, *Tucson;* Governor N. O. Murphy (*ex officio*), *Phoenix;* R. L. Long (*Territorial Supt. of Public Instruction*), *Phoenix.*

STATION STAFF.

F. Yale Adams, M. A., *Acting President of the University.*
R. H. Forbes, M. S., *Dir.; Chem.*
A. J. McClatchie, M. A., *Agr. and Hort.*
G. H. True, B. S., *Animal Husb.*
John J. Thornber, M. A., *Bot.*
W. W. Skinner, M. S., *Asst. Chem.*
T. D. A. Cockerell (East Las Vegas, N. Mex.), *Consulting Ent.*
S. M. Woodward, *Consulting Met.*
J. W. Shelor, *Clerk.*

LINES OF WORK.

During the past year the work of the Arizona Station has been mainly a continuation of lines of investigation taken up in previous years, including investigations of garden, forage, and green manuring crops, grains, varieties of eucalyptus and fruits; experiments with the date palm and with sugar beets; studies of methods of irrigation; investigation of the irrigation waters of the Territory, with particular reference to their fertilizing value and salt content; investigations of soil moisture; methods of stock feeding and dairy management for southern Arizona; study of range conditions, including native grasses and also arid-region grasses, saltbushes, and forage plants from other parts of the world. The station is cooperating with this Office in irrigation investigations; with the Bureau of Soils of this Department, in soil mapping and investigations of alkali soils; with the Bureau of Chemistry, in studies of the influence of environment on the sugar content of muskmelons; and with the Bureau of Plant Industry, in experiments in date culture, plant breeding, and range improvement. For the range experiments the station has secured control of about 350 acres of land near Tucson, which has been placed in charge of the botanist of the station. One of the main objects of this work is to demonstrate the advantages of range reserves as a means of not only preserving and improving the ranges, but also of conserving moisture and preventing soil erosion and floods. In cooperation with the Bureau of Soils of this Department the station has completed a soil and alkali survey of Salt River Valley and the Buckeye country, which will for the first time give definite information concerning the nature and extent of the various types of soil and the amount, kind, and distribution of alkali salts in this region.

The date-palm orchard, after one year's operations, shows 71 per cent of the stock in good condition, 11 per cent doubtful, and 18 per cent dead. This result is considered quite satisfactory in view of the experimental methods of shipment employed, the two months' journey of the trees during the hot season, and the unfavorable conditions at the time the plants arrived. The department of animal husbandry, in addition to its scientific investigations, is doing important demonstrative and cooperative work in the testing of cows, the use of hand separators, and the dehorning of calves, in order to introduce improved methods in this important branch of agriculture. Winter irrigation

of orchards has been found beneficial and is strongly advised. At the close of the year the botanist of the station, Dr. David Griffiths, resigned to accept a position in the United States Department of Agriculture, and John J. Thornber has been appointed to succeed him.

INCOME.

The income of the station during the past fiscal year was as follows:

United States appropriation	$15,000.00
Farm products	779.06
Miscellaneous, including balance from previous year	322.10
Total	16,101.16

A report of the receipts and expenditures for the United States fund has been rendered in accordance with the schedules prescribed by this Department, and has been approved.

PUBLICATIONS.

The publications of this station received during the past fiscal year were Bulletins 34–37 and the Annual Report for 1900.

Bulletin 34, pp. 56, figs. 14.—Timely Hints for Farmers.—This is made up of reprints of popular articles issued by the experiment station from October 1, 1899, to June 15, 1900, based largely on the results of experiments at the station.

Bulletin 35, pp. 32, figs. 5.—Vegetable Growing in Southern Arizona.—Cultural directions based on the results of station experience are given for growing all the more common garden vegetables.

Bulletin 36, pp. 23, dgms. 2.—Experimental Work with Sugar Beets during 1900.—A detailed report on cooperative culture experiments with sugar beets carried on under the direction of the station in the Upper Gila district.

Bulletin 37, pp. 38, pls. 3, figs. 3, dgms. 3.—Winter Irrigation of Deciduous Orchards.—Earlier experiments on the effect of winter irrigation on orchard production and on the moisture content of the soil throughout the season are reviewed, further experiments along this line are reported, and principles involved in winter and summer irrigation are discussed. Meteorological observations and determinations of the moisture content of the soil are reported in tables, the latter being also shown in diagrams.

Annual Report, 1900, pp. 49, pls. 2, figs. 2.—This contains a report of the director on the work, staff, and publications of the station, including notes on additions to the station farm, the date-palm orchard, range improvement, and on needs of the station; a financial statement for the fiscal year ended June 30, 1900; and reports of the heads of departments containing the results of tests of wheat grown for milling purposes and of varieties of cereals grown for hay; results of tests of

a number of forage and green manuring plants; cultural notes and results of tests of varieties of cabbage, lettuce, watermelons, onions, cauliflower, and potatoes; a brief account of experiments in irrigating orchards in winter; results of irrigation experiments with sugar beets; notes on the different species of Eucalyptus being tested at the station; a brief account of investigations conducted at the station on the crown gall and on alfalfa root rot; notes on economic cacti; a report of feeding experiments with steers, in which is given the comparative value of corn fodder, Kafir-corn fodder, and sorghum fodder supplementary to alfalfa hay was tested, and of feeding experiments with sheep, in which the comparative value of alfalfa hay and of sorghum fodder alone, mixed, and supplemented by sugar beets, was tested; notes on feeding and testing cows and on the use of hand separators; and tabulated analyses of river and artesian waters and of sugar beets.

GENERAL OUTLOOK.

The staff of the Arizona Station have their work carefully planned and are apparently making satisfactory progress in their efforts to improve the agricultural conditions of the Territory, especially along the more important lines of stock raising, fruit production, irrigation, and range improvement. The investigations of range improvement are being vigorously prosecuted and promise to yield very valuable results for the Territory. In this work, as well as in the work with date palms, the United States Department of Agriculture is cooperating with the station. The department of agriculture and horticulture has operated upon the station farm near Phoenix, where the investigations on forage plants, grains, orchard management, and duty of water are of peculiar importance to the welfare of the region. In the same place the department of animal husbandry, now in its second year, has continued and extended its operations. The station also finds it advisable to cooperate with farmers in various parts of the Territory in testing varieties, conducting dairy investigations, etc., not only for the purpose of testing local conditions, but also for the purpose of popularizing the work of the station. A most potent factor in disseminating information and calling the attention of the people to the work of the station has been the distribution of leaflets called "Timely hints for farmers," which continue to be very favorably received. It is the purpose to make these leaflets practical and timely and to distribute them freely throughout the whole southwestern region of the United States where the conditions are similar to those in Arizona. The university with which the station is connected has received an increased appropriation for maintenance, which it is expected will be so used as to benefit the station. There is need of funds for the development of farmers' institute work in the Territory.

ARKANSAS.

Arkansas Agricultural Experiment Station, *Fayetteville.*

Department of Arkansas Industrial University.

GOVERNING BOARD.

Board of Control—Agricultural Committee: Henry Stroup (*Pres.*), *Paris;* W. H. Langford, *Pine Bluff;* V. Y. Cook, *Elmo;* J. L. Buchanan (*Pres. University*), *Fayetteville;* R. L. Bennett, *Fayetteville.*

STATION STAFF.

J. L. Buchanan, LL. D., *President of the University.*
R. L. Bennett, M. S., *Dir.*
R. R. Dinwiddie, M. D., *Path. and Bact.*
C. L. Newman, B. S., *Agr.*
Ernest Walker, B. S. Agr., *Hort. and Ent.*
J. F. Moore, B. S., *Asst. Chem.*
G. B. Irby, B. A., *Asst. Agr. at Newport.*

LINES OF WORK.

The work of the Arkansas Station during the past year has included a chemical study of fats; a study of human and bovine tuberculosis; investigations of contagious swine diseases, with field and laboratory tests of preventive vaccination against swine pest and swine plague; experiments with trucking crops to aid and encourage that line of farming; observations on insects injurious to fruits and vegetables; experiments with legumes for soil improvement, and observations on the effect produced on the soil as indicated by succeeding crops; experiments in the economic production of pork and the influence of different feeding stuffs on the quality of the same; tests of different Southern feeds in feeding sheep for mutton and for wool. Considerable work has been done in testing various plants for hay and for pasture and a report issued. A preliminary report has been issued also on the pig-feeding experiments, in which the animals were grazed on soy beans, peanuts, and chufas planted in alternate rows in the field. This work was conducted at Newport under the direction of an assistant in agriculture.

INCOME.

The income of the station during the past fiscal year was as follows:

United States appropriation	$15,000.00
Farm products and miscellaneous	1,007.28
Total	16,007.28

A report of the receipts and expenditures for the United States fund has been rendered in accordance with the schedules prescribed by this Department, and has been approved.

PUBLICATIONS.

The publications of this station received during the past fiscal year were Bulletins 61–65 and the Annual Report for 1900.

Bulletin 61, pp. 17, fig. 1.—Some Hay, Forage, and Pasture Plants.—This bulletin gives the result of various tests of annual plants for hay, pastures, and forage; plants for permanent meadows and pastures; and special crops for pig raising. The value of the different crops in different portions of the State is considered in detail, and cultural directions are given. A list of the more valuable clovers and other legumes, forage plants, and grasses that have been tested at the station is appended.

Bulletin 62, pp. 18, fig. 1.— Wheat Experiments.—A report of experiments in wheat culture, embracing preparation of the soil, rotation, seeding, and variety tests.

Bulletin 63, pp. 29 (Popular edition, pp. 5).—The Relative Susceptibility of the Domestic Animals to the Contagia of Human and Bovine Tuberculosis.—This is an account of experiments along the same line as those reported in an earlier publication of the station. The susceptibility of cattle, sheep, and pigs to pure cultures of the tubercle bacillus of human and bovine origin was tested in 7 series of inoculation experiments which are reported in detail.

Bulletin 64, pp. 18, figs 5.—Notes on Celery.—Several culture, fertilizer, and irrigation experiments with celery are reported, and general suggestions are given for growing this crop.

Bulletin 65, pp. 14.—Pig Feeding Experiments.—Experiments are reported the object of which was to determine the amount of corn required to produce pork of the desired hardness where pigs had previously been grazed on such forage crops as soy beans, peanuts, and chufas. Earlier experiments in grazing pigs are reviewed and data given concerning the melting point of the fat obtained.

Annual Report, 1900, pp. 114, figs 7.—This includes a financial statement for the fiscal year ended June 30, 1900, a brief report of the director, reprints of Bulletins 61–65 of the station, notes on trial orchards being established by the station throughout the cotton-growing sections of the State, and brief mention of the occurrence of crown gall on apple trees in orchards and nurseries.

GENERAL OUTLOOK.

The Arkansas Station is continuing its well-defined policy of diversifying agriculture in regions where the continuous production of cotton has impoverished the soil. This it is accomplishing by the introduction of new legumes for forage and green manuring, by encouraging the trucking and fruit-growing industries of the State, by demonstrating the value of soy beans, peanuts, and chufas as grazing crops for hogs, and by assisting in farmers' institutes.

CALIFORNIA.

Agricultural Experiment Station of the University of California, *Berkeley.*

Department of the University of California.

GOVERNING BOARD.

The Regents of the University: Gov. H. T. Gage (*Pres.*), *Sacramento;* Louis Sloss (*Treas.*), *310 Sansome street, San Francisco;* E. W. Davis,[a] (*Sec.*), *Santa Rosa;* Jacob H. Neff, *Auburn;* C. W. Pendleton, *Los Angeles;* T. J. Kirk, *Sacramento;* A. B. Spreckels, *327 Market street, San Francisco;* Samuel C. Irving, *116 Battery street, San Francisco;* Benjamin Ide Wheeler, *Scenic avenue, Berkeley;* William T. Wallace, *799 Van Ness avenue, San Francisco;* Isaias W. Hellman, *Nevada National Bank, San Francisco;* Arthur Rodgers, *309 Montgomery street, San Francisco;* J. F. Houghton, *328 Montgomery street, San Francisco;* Chester Rowell, *Fresno;* J. A. Waymire, *Alameda;* C. W. Slack, *309 Montgomery street, San Francisco;* J. B. Reinstein, *217 Sansome street, San Francisco;* Mrs. Phoebe A. Hearst, *Mills Building, San Francisco;* W. H. L. Barnes, *Crocker Building, San Francisco;* C. N. Ellinwood, *corner Pacific avenue and Devisaders street, San Francisco;* A. W. Foster, *Mutual Life Insurance Building, San Francisco;* Garrett W. McEnerney, *309 Montgomery street, San Francisco;* George C. Pardee, *Chronicle Building, San Francisco.*

STATION STAFF.

Benjamin Ide Wheeler, PH. D., LL. D., *President of the University.*

E. W. Hilgard, PHD., L. L. D., *Dir.; Chem.*
E. J. Wickson, M. A., *Hort.*
W. A. Setchell, PH. D., *Bot.*
R. H. Loughridge, PH. D., *Agr. Geol. and Phys.* (*Alkali Investigations*).
M. E. Jaffa, PH. B., M. S., *Asst. Chem.* (*Foods, Soils, and Fertilizers*).
C. W. Woodworth, M. S., *Ent.*
A. R. Ward, B. S. A., D. V. M., *Vet. and Bact.*
G. W. Shaw, PH. D., *Asst. Chem.* (*Soils and Sugars*).
Leroy Anderson, M. S. A., *Dairy Husb.*
George E. Colby, PH. B., M. S., *Asst. Chem.* (*Fruits, Waters, and Insecticides*).
J. Burtt Davy, *Asst. Bot.*
Warren T. Clarke, *Asst. Ent. Pro tem.*
E. H. Twight, Diplomé E. A. M., *Vit.*
C. H. Shinn, B. A., *Inspector Sta.*
Emil Kellner, *Foreman Grounds.*

C. A. Colmore, *Clerk to Dir.*

OUTLYING STATIONS.

Southern Coast Range Station, S. D. Merk, *Patron, Paso Robles;* ——— ———, *Foreman, Paso Robles.*

San Joaquin Valley Station, John Tuohy, *Patron, Tulare;* Julius Forrer, *Foreman, Tulare.*

Sierra Foothill Station, R. C. Rust, *Patron, Jackson;* J. H. Barber, *Foreman, Jackson.*

Southern California Station, S. N. Androus, *Patron, Chino;* James W. Mills, *Foreman, Ontario.*

Chico Forestry Station, C. C. Royce, *Patron, Chico;* T. H. Bohlender, *Workman in Charge.*

Santa Monica Forestry Station, Roy Jones, *Patron, Santa Monica;* William Shutt, *Foreman, Santa Monica.*

LINES OF WORK.

The work of the California Station during the past year has followed practically the same lines as in previous years. Special attention has

[a] On leave.

been given to the study of soils, soil moisture, and alkali, and the resistance of plants to drought and alkali; chemical studies of humus and the availability of plant food in soils; plant and seed introduction and distribution and tests of the adaptability of various introduced plants to California conditions; study of range conditions and of the distribution of grasses and forage plants; experiments with vines resistant to phylloxera, including methods of propagation and grafting; tests of species and varieties of fruit, nut, and forest trees and of their adaptability to different parts of the State; investigations relating to injurious insects and diseases and means of combating them; studies in human nutrition; and miscellaneous chemical work, including analyses of soils, waters, sugar beets, fruits, dairy products, foods and feeding stuffs, fertilizers, etc. The station is cooperating with this Office in nutrition investigations; with the Bureau of Chemistry of this Department in investigations on the gluten content of wheat, methods of analyzing soils, and the influence of environment on the sugar content of muskmelons; and with the Bureau of Plant Industry of this Department in planting and testing sand-binding plants. A recent legislative enactment requires the station to inspect Paris green offered for sale in the State.

Work has been continued at the six substations and has included irrigation, drainage, and forestry investigations and field experiments with a great variety of forage plants, cereals, and fruits. At three of these substations the water systems have been considerably improved. The more active operations at the Southern Coast Range substation at Paso Robles have been discontinued, but the station has not been entirely abandoned. The university has been given $250,000 a year for two years, in addition to its regular income. From this amount $10,000 has been set aside for the equipment and maintenance of a department of dairy husbandry.

INCOME.

The income of the station during the past fiscal year was as follows:

United States appropriation	$15,000.00
State appropriation	11,543.00
Farm products	54.79
Total	26,597.79

A report of the receipts and expenditures for the United States fund has been rendered in accordance with the schedules prescribed by this Department, and has been approved.

PUBLICATIONS.

The publications of this station received during the past fiscal year were Bulletins 129–131, Seed List No. 5, and the Annual Report for 1898.

Bulletin 129, pp. 34, pls. 3, figs. 2.—Report on the Condition of Olive Culture in California.—This gives the results of an investigation of the causes of depression in the olive industry in California, discussed under the headings of (1) cultural conditions, including improper selection of soils and neglect of tillage, irrigation, pruning, and fighting diseases and insect pests, and (2) commercial conditions, including competition with cotton-seed oil and other oils sold as olive oil, poor harvesting and manufacturing methods, and the selection of unsuitable varieties. Pickling olives and preserving the product from bacterial growths are discussed at some length.

Bulletin 130, pp. 12, figs. 4.—Preservation of Unfermented Grape Must.—The composition of pure grape must and of the products sometimes found on the market is discussed, as well as the causes of spoiling of grape juice, and the chemical and physical means of preventing fermentation.

Bulletin 131, pp. 16, fig. 1.—The Phylloxera of the Vine.—A brief historical review of the gradual distribution of phylloxera in European countries, and its subsequent importation into California, together with notes on the life history and habits of the pest and a discussion of remedial measures.

Exchange Seed List No. 5, pp. 11.—A list of seeds of economic plants offered for exchange, and a list of seeds desired by the station.

Annual Report, 1898, pp. 367, pls. 25, figs. 34.—This contains the organization list of the station; a financial statement for the fiscal year ended June 30, 1898; a brief review of station work by the director; discussions on preparatory teaching in agricultural colleges and on farmers' institutes; reports on the examination of samples of soil from different parts of California, and studies of the endurance of drought in soils of the arid region and of moisture in California soils during the dry season of 1898; a study of the accumulation of alkali in irrigated soils used for the culture of citrus fruits, and the effect of this alkali upon the growth of these fruits; analyses of a large number of samples of soils, waters, feeding stuffs, and sugar beets; a discussion of the use of saline and alkali waters in irrigation; physical, food, and ash analyses of 7 varieties of apples grown in different parts of the State; determinations of the nicotine content of 11 varieties of tobacco grown at the station; a discussion of the nutritive value of desiccated vegetables, including analyses of evaporated potatoes and carrots; determinations of the sugar content of fresh and canned apricots; results of investigations relating to the materials used in the manufacture of cans, and to methods employed in canning food products; data concerning the physical and chemical properties of salad oil; notes on tests of various antiseptics; results of investigations undertaken to study the effect of sunlight in conserving storage water from bacterial contamination; brief notes on the olive knot and on the California

vine hopper, supplementary to earlier publications of the station on these subjects; directions for the preparation and use of several insecticides and fungicides; brief notes on a number of plant diseases; reprints of Bulletin 119 of the station on vine pruning, and 124 on lupines for green manuring, and of a station circular on extermination of weeds; notes on the growth of lupines on calcareous soils; measurements of tanbark acacias or wattle trees planted at the forestry station at Santa Monica, and determinations of the tannin content of the bark and the results of practical tanning tests; meteorological observations; a statement concerning the amount and kind of seeds and plants distributed by the station since 1886, with reports on the growth and value of roselle, fenugreek, saltbushes, and other plants included in the distribution; lists of donations to the university botanic garden; notes on plants received for identification; and detailed reports on the farm and orchard crops growing at the Foothill, Southern Coast Range, San Joaquin Valley, and Southern California culture substations, and on the trees growing at the Chico and Santa Monica forestry substations.

GENERAL OUTLOOK.

During the year the California Station has published the results of investigations with olives and other fruits, grape must, phylloxera, soils of the arid region, alkali in irrigated soils, tobacco, legumes, and forest trees. The diversified productions of California necessitate a wide range of investigations, and hence the attempt has been made to study problems more or less local in nature at the substations. Thus, for twelve years the substation near Paso Robles has been made the center of observations relating to the deciduous fruit interests over an extensive region; the substation near Jackson has investigated the fertilizer needs of that region, using with success vetches and European lupines, and has successfully grown olives for oil, besides starting a plantation of Smyrna and Capri figs; and the substation near Pomona has been the center of a wide range of studies on citrus fruits, particularly the orange. The general success of the station's operations has led to a popular demand for more work than the station has funds to support. To carry on thoroughly satisfactory investigations for so large an agricultural region as is found in the State of California, the station needs larger financial resources, and with the increased resources of the college of agriculture of the university, it is hoped that it may be possible to extend the operations of the station. The number of outlying substations should either be reduced or more ample provision should be made for their maintenance under conditions which will bring their work into more direct relation with the operations of the central station.

COLORADO.

Agricultural Experiment Station, *Fort Collins.*

Department of The State Agricultural College of Colorado.

GOVERNING BOARD.

P. F. Sharp (*Pres.*), *Denver;* B. U. Dye, *Rockyford;* W. R. Thomas, *Pruden*; Harlan Thomas, *Denver;* James L. Chatfield, *Gypsum;* B. F. Rockafellow, *Canon City;* Mrs. Eliza F. Routt, *Denver;* Jesse Harris, *Fort Collins;* Gov. J. B. Orman, *Denver;* President B. O. Aylesworth, *Fort Collins.*

STATION STAFF.

Barton O. Aylesworth, M. A., LL. D., *President of the College.*

L. G. Carpenter, M. S., *Dir.; Met. and Irrig. Engin.*
C. P. Gillette, M. S., *Ent.*
W. P. Headden, M. A., Ph. D., *Chem.*
B. C. Buffum, M. S., *Agr.*
Wendell Paddock, M. S., *Bot. and Hort.*
A. H. Danielson, B. S., *Asst. Agr.*
F. M. Rolfs, B. S., *Asst. Hort.*
A. M. Hawley, *Sec.*
A. D. Milligan, *Clerk and Sten.*
Fred Alford, B. S., *Asst. Chem.*
Earl Douglass, *Asst. Chem.*
R. E. Trimble, B. S., *Asst. Met. and Irrig. Engin.*
E. D. Ball, M. S., *Asst. Ent.*
Ray Calloway, *Farm Foreman.*
H. H. Griffin, B. S., *Field Agent, Arkansas Valley Substa., Rockyford.*
J. E. Payne, M. S., *Field Agent.*

LINES OF WORK.

The work of the Colorado Station for the past year has been similar to that of former years, including studies of irrigation problems; variety tests of wheat and oats for different altitudes; feeding experiments with Belgian hares, lambs, and swine; horticultural, entomological, and chemical investigations; and meteorological observations. The work of the irrigation engineer has included investigations on the use of water for irrigation as applied on different farms under varying conditions, and measurements of seepage, the latter for the special purpose of determining the important relation between the area irrigated, or the amount of water applied, and the amount returned. These measurements are made on the Platte, the Arkansas, the Rio Grande, and their tributaries, and have been extended recently some 40 miles above the section formerly measured on the Rio Grande. Measurements are also being made of losses from ditches, principally in the Cache la Poudre and Arkansas valleys, and the best means for economizing water are being studied. The principal horticultural work is the study of a disease of peas and the continuation of variety tests of native plums and small fruits. The entomologist is investigating the ravages of the codling moth, peach twig and apple twig borers, various leaf rollers, cutworms on alfalfa, grasshoppers, and insects working on sugar beets and cantaloupes, and is continuing tests of comb foundations and studies of foul brood. The chemical work includes analysis of water used in irrigation; studies of means for extracting beeswax from old combs; sugar-beet investigations; soil

analysis, especially as related to the humus and alkali problems and nitrification; studies of methods of analysis of feeding stuffs, especially the composition of the proximate groups; and digestion experiments.

Among lines of work outlined for investigation in the immediate future are investigations bearing on the accurate determination of the duty of water in irrigation, tests of forage plants, improvement of pastures and waste lands, and experiments in stock feeding. A $10,000 barn is now being built, which contains feeding stalls costing $1,200. During the year an insectary has been constructed, and the college has made plans for a $40,000 engineering building, which will contain offices for the director and irrigation engineer of the station. At the beginning of the year B. C. Buffum, of Wyoming University, succeeded W. W. Cooke as agriculturist of the station, and Wendell Paddock succeeded J. H. Cowen, deceased, as botanist and horticulturist. A veterinary department has been established and Dr. G. H. Glover has been placed in charge. The mailing list has been changed from book to card-index form, and press bulletins have been published. A feature of the bulletin work has been the issuing of "river press" bulletins, noting weekly measurements of water in the Cache la Poudre River, which have been distributed to those in the northern part of the State interested in the condition of water in that river.

The substation at Cheyenne Wells has been abandoned, and at Rockyford the work has been confined to tests of the adaptability of varieties of grains, fruits, grasses, and forage crops to the region; culture of sugar beets; culture and improvement of melons; propagation, culture, and fertilization of tomatoes; feeding experiments with sheep (cooperative, without expense to the station) to determine the feeding value of beet-sugar factory pulp. The station has arranged several lines of investigation in cooperation with this Department, including a study of the codling moth, with the Division of Entomology; studies of the gluten content of wheat and of the influence of environment on the sugar content of muskmelons, with the Bureau of Chemistry; tree planting, with the Bureau of Forestry; and experiments with forage crops for alkali and arid soils, with the Bureau of Plant Industry.

INCOME.

The income of the station during the past fiscal year was as follows:

United States appropriation	$15,000.00
Farm products	1,280.10
Miscellaneous, including balance from previous year	624.34
Total	16,904.44

A report of the receipts and expenditures for the United States fund has been rendered in accordance with the schedules prescribed by this Department, and has been approved.

PUBLICATIONS.

The publications of this station received during the past fiscal year were Bulletins 54, 56–63, and the Annual Report for 1900.

Bulletin 54, pp. 28, pls. 6.—Apiary Experiments.—Investigations in regard to what extent and in what form wax can best be furnished bees for their use in building comb are reported. The experiments were conducted to answer the following questions: Do bees use wax from artificial foundations to extend the cell walls and the comb midrib? Is the wax of the midrib of the foundation used in comb building? Does the use of artificial foundations result in thicker cell walls in the comb? To what extent does the foundation lessen the secretion of wax by bees? Methods of using foundation in sections were compared and substitutes for pollen tried.

Bulletin 56, pp. 63.—The Birds of Colorado.—A second appendix to Bulletin 37 of the station on the same subject, containing corrections and additional notes on the birds of Colorado.

Bulletin 57, pp. 39.—Farm Notes.—This bulletin is a résumé of the results of different experiments with alfalfa, corn, potatoes, and sugar beets carried on at the station during the years 1894–1899. The work has all been reported in previous publications of the station except cooperative culture experiments with sugar beets.

Bulletin 58, pp. 46.—A Soil Study of Sugar Beets.—Experiments here reported embrace a study of irrigation, manuring, and alkali content of the soil in connection with sugar-beet culture, and an investigation on the influence of drying and soaking the beets and the size of the beets on the composition.

Bulletin 59, pp. 16, pls. 2, map 1.—Investigation of the Great Plains—Field Notes from Trips in Eastern Colorado.—Information obtained from interviewing settlers in Kit Carson and Arapahoe counties as to methods employed and results obtained in tree planting, fruit growing, and stock raising is given, together with notes on methods of irrigation, the results obtained with different field crops, character of the soil, weeds, and insects.

Bulletin 60, pp. 12.—Bush Fruits, including Gooseberries, Raspberries, Blackberries, Dewberries.—Brief cultural notes with the results of tests of 6 varieties of gooseberries, 12 of currants, 23 of raspberries, and 12 of blackberries and dewberries.

Bulletin 61, pp. 10.—Bromus inermis.—Directions for the culture of this grass, with the results of tests on the college grounds and at the Arkansas Valley and the Plains substations since 1892.

Bulletin 62, pp. 18, pl. 1.—Cantaloupes.—An account is given of the methods followed in growing cantaloupes at Rockyford, together with the results of some experimental work along the lines of irrigation, fertilizing, and transplanting, and data on the proportion of male

and female flowers produced on muskmelon vines on different dates during the season. A blight of cantaloupes due to *Macrosporium cucumerium* is described, and experiments carried on during two years for the control of this disease are reported. Other diseases and insect enemies of cantaloupes are noted.

Bulletin 63, pp. 32.—Sugar Beets.—A review of the work with sugar beets carried on at the station up to the present time and reported in earlier bulletins of the station.

Annual Report, 1900, pp. 149.—This includes a financial statement for the fiscal year ended June 30, 1900; a report of the director, giving the regulations of the State board of agriculture governing the operations of the station, detailed plans for station work for 1900, and a general review of the work of the station and substations; departmental reports, giving detailed accounts of the different lines of station work and containing brief biologic and economic notes on a large number of insects and measurements to determine the gains or losses from seepage; a report of the superintendent of the Arkansas Valley substation, giving notes on experiments with cantaloupes, sugar beets, tomatoes, grasses and leguminous plants, potatoes, wheat, and apples; a report of the superintendent of the Plains substation, including notes on the fruits, vegetables, and field crops under cultivation, notes on the forest trees planted as wind-breaks, observations on soil moisture, and notes on the agricultural conditions of eastern Colorado; a tabulated daily and monthly summary of meteorological observations during 1900; a tabulated record of weekly observations on soil temperatures at different depths in irrigated and unirrigated soils; and observations on evaporation from water surfaces.

GENERAL OUTLOOK.

The Colorado Station has been undergoing a gradual reorganization since the appointment of the present director two years ago. The result is a greater unification and concentration of experimental work along lines of primary importance to the agriculture of the State. Except at Fort Collins, the work done is assuming more and more the nature of a reconnoissance for the purpose of discovering the agricultural possibilities of the different sections of the State. From reports already made, it appears that next in importance to the investigation of problems in irrigation come those related to stock raising, such as production and use of feeding stuffs, securing and maintenance of permanent pasture, production of useful plants on waste lands, and trials of native hay and pasture grasses on new ranges. Some difficult problems attend the growing of potatoes, an important crop of the State, and these, together with problems in fruit growing, the production of pears, cantaloupes, tomatoes, and other field and garden crops, and the

suppression of destructive insect pests, demand and receive attention. In connection with all of these problems those of irrigation are more or less important and must be considered. The director, relieved now in a measure from the unusual burden of reorganizing the station, proposes to give more time to investigations bearing on the accurate determination of the duty of water in irrigation, and to undertake scientific investigations of the water requirements of specific plants under different climatic and soil conditions. This is an important line of work, and one which the Colorado Station is in an excellent position to undertake. With the growth of agricultural interests in Colorado and the development of the agricultural college there is increasing need of additional funds for the work of the station, and it is hoped the State will shortly supplement the national funds for this purpose.

CONNECTICUT.

The Connecticut Agricultural Experiment Station, *New Haven.*

GOVERNING BOARD.

State Board of Control: Governor George P. McLean (*Pres.*), *Hartford;* W. H. Brewer (*Sec.*), *New Haven;* E. H. Jenkins (*Treas.*), *New Haven;* W. O. Atwater, *Middletown;* Edwin Hoyt, *New Canaan;* J. H. Webb, *Box 1425, New Haven;* T. S. Gold, *West Cornwall;* B. W. Collins, *Meriden.*

STATION STAFF.

E. H. Jenkins, PH. D., *Dir.*
A. L. Winton, PH. B., *Chem.*
T. B. Osborne, PH. D., *Chem.*
A. W. Ogden, PH. B., *Chem.*
M. Silverman, PH. B., *Chem.*
I. F. Harris, PH. B., *Chem.*
W. E. Britton, B. S., *Hort. and State Ent.*
Walter Mulford, B. F., *In Charge of Forestry Work and State For.*
Miss V. E. Cole, *Libr. and Clerk.*
Miss L. M. Brautlecht, *Asst. Clerk.*
William Vietch, *In Charge of Buildings and Grounds.*
Hugo Lange, *Lab. Asst.*
William Pokrob, *Lab. Asst.*
J. B. Olcott, *Grass Gardener* (*South Manchester*).
V. L. Churchill, *Sampling Agent.*

LINE OF WORK.

The Connecticut State Station during the past year has continued lines of work formerly established, and inaugurated some new investigations. The study of vegetable proteids has been continued, as have also studies of the availability of organic nitrogen in various forms by means of pot experiments with Hungarian grass and redtop grass; forcing-house experiments with tomatoes; experiments in grafting chestnuts; forestry experiments for the utilization of waste lands; spraying experiments; study of diseases of vegetables; tobacco investigations; seed testing; and the analysis and control of fertilizers, foods, and feeding stuffs. In connection with the fertilizer and food inspection the station chemists have analyzed a large number of sam-

ples of Hungarian and redtop grasses, and have studied analytical methods for the detection of adulterations in food products. Observations were made on a widespread disease of peach trees and raspberry vines related to the crown gall, but far more destructive, and material was collected for future study.

During the year Prof. S. W. Johnson, advising and consulting chemist, entirely severed his connection with the station. W. E. Britton, horticulturist, has been made State entomologist under the provisions of a State law concerning insect pests, approved June 10, 1901, which appropriates $3,000 a year for nursery inspection, the salary of the entomologist to be paid by the station. The office of State forester has also been created and filled by the appointment of Walter Mulford, whose salary will be paid by the station, and who will have charge of the forestry work for the station in addition to the State forestry work, for which an appropriation of $2,000 per year was made. Station work in forestry was begun with planting white pine, white oak, and chestnut on a 100-acre lot at Poquonock belonging to the station.

INCOME.

The income of the station for the past fiscal year was as follows:

United States appropriation	$7,500.00
State appropriation	12,500.00
Individuals and communities	1,580.59
Fees	7,730.40
Farm products	911.85
Miscellaneous	139.91
Total	30,362.75

A report of the receipts and expenditures for the United States fund has been rendered in accordance with the schedules prescribed by this Department, and has been approved.

PUBLICATIONS.

The publications of this station received during the past fiscal year were Bulletins 131–133 and the Annual Reports for 1899, Part III, and 1900, Parts I, II, and III.

Bulletin 131, pp. 30, pl. 9.—The Protection of Shade Trees in Towns and Cities.—An account of the present condition of shade trees in the city of New Haven, Conn., statements concerning the causes of their destruction, suggestions for protecting shade trees against various injuries, outline of the duties of a city forester, and brief descriptions of trees most suitable for street planting.

Bulletin 132, pp. 7.—Condimental and Medicinal Cattle and Poultry Foods.—Analyses of 15 samples of condimental and medicinal cattle and poultry foods, with a brief discussion of this subject.

Bulletin 133, pp. 29.—Commercial Feeding Stuffs in the Connecticut Market.—An account of the inspection of feeding stuffs during 1900, including tables showing the chemical composition, digestible nutrients, and cost per ton of 186 samples of commercial feeding stuffs collected in 25 towns and villages in the State.

Annual Report, 1899, Part III, pp. 211, pl. 3, fig. 1.—This contains a detailed account of experiments on (1) the availability to grass of nitrogen in form of nitrate of soda, cotton-seed meal, and fine, hard bone; (2) the availability to Hungarian grass of nitrogen in form of nitrate of soda, cotton-seed meal, and raw, boiled, and steamed bone; and (3) the availability of the nitrogen of hard, raw bone as affected by applications of slaked lime; observations on the effect of nitrogen in the form of nitrate of soda, cotton-seed meal, and ground bone upon the growth of California privet; detailed results for 1899 of extensive experiments in the use of commercial fertilizers and different soils in growing tomatoes, lettuce, and carnations under glass; a brief account of investigations of a stem-rot disease of carnations due to a species of Fusarium; notes on the effect of winter upon chestnut grafts and scions; brief notes on a number of injurious insects; a reprint in revised form of Bulletin 129 of the station on the inspection and care of nursery stock; results of experiments to study the effects of shading and liming tobacco on the prevalence of diseases and the yield and quality of the crop; notes on the so-called "grain" of wrapper tobacco considered due to deposits of oxalate of lime, and on the pole burn of tobacco due to fungi; results of a test of fertilizers applied in small quantities from time to time throughout the growing season for the prevention of the wilt disease of muskmelons; a discussion of the nature and prevention of raspberry anthracnose, with the results of some experimental work; notes on the downy mildew of melons, a destructive disease of potatoes, injury to peas, leaf spot of alfalfa, and a disease of peppers; a report of progress on experiments in fertilizing peaches with ashes and different amounts of muriate and sulphate of potash and cotton-seed meal; an account of experiments in 1899 similar to earlier work in curing tobacco in a barn provided with hot-air flues and in fermenting Connecticut tobacco in bulk; a determination of the area of leaf surface on the topped tobacco plant; results of tests for vitality of 291 samples of seeds, chiefly of garden vegetables; and chemical studies of the nucleic acid of the embryo of wheat and its protein compounds, the proteids of the egg yolk, and the protein constituents of egg white. Brief reports of the director and board of control on station work during the year, and a financial statement for the year ended September 30, 1899, accompany this part of the annual report.

Annual Report, 1900, Parts I, II, and III, pp. 395, pls. 16, figs. 12.—Part I includes fertilizer statistics for 1900, the text and an abstract

of the State laws relating to fertilizers, notes on the sampling and collecting of fertilizers, explanations regarding the analysis and valuation of fertilizers, a report on determinations of the solubility of organic forms of nitrogen in pepsin-hydrochloric acid, and tabulated analyses and valuations of 466 samples of fertilizing materials. Part II contains the text of the Connecticut food law and the law regulating the sale of commercial feeding stuffs, detailed results of the examination of 824 samples of foods, condiments, water, etc., with notes on methods of examination in some cases; a botanical study of the corncob with special reference to the detection of ground cobs in wheat or rye bran, and a description of a micro-polariscope for food examination. Part III includes an account of extensive spraying experiments with Bordeaux mixture of different strengths, soda-Bordeaux mixture, ammoniacal copper carbonate solution, copper acetate, and potassium sulphid to test the effect of these fungicides upon peach foliage; a provisional bibliography of the more important works published by the United States Department of Agriculture and the agricultural experiment stations of the United States from 1887 to 1900, inclusive, on fungus and bacterial diseases of economic plants; results for 1900 of plat experiments in the greenhouse with lettuce and carnations, in which several soils and various commercial fertilizers were compared; a brief description of a vegetation house arranged for carrying out pot experiments; an account of a test made in continuation of earlier work of the proper time for setting chestnut scions in Connecticut, and of the value of native sprouts as stocks upon which to graft the European and Japanese varieties; a brief report on experiments with hydrocyanic-acid gas in barn and greenhouse; notes on the banding of trees to prevent injury by the fall cankerworm; miscellaneous notes on insects and insecticides; an account of an experiment to determine if wrapper leaf tobacco of the Sumatra type can be grown in Connecticut; a reprint with minor changes of Bulletin 131 noted above; data for a fertilizer experiment with peaches; and reprints of Bulletins 132 and 133 of the station noted above.

GENERAL OUTLOOK.

The experiments last year in growing Sumatra tobacco in the shade were so successful that this year about 42 acres have been grown in the shade in Connecticut. In these investigations the station is cooperating with the Bureau of Soils of this Department and with the Connecticut Tobacco Experiment Company at Poquonock. The experiments in grafting chestnuts have met with severe reverses from fire, but have been successful in demonstrating that the best time for grafting in Connecticut is about the middle of May. The work in forestry and in the protection of shade and fruit trees is attracting favorable attention throughout the State. For the forestry experiments the station has

used part of the proceeds of the William R. Lockwood bequest in purchasing waste land at Poquonock. This work, the inspection work, attendance at farmers' meetings, and cooperative experiments in different parts of the State have aroused more than usual interest among the farming population.

Storrs Agricultural Experiment Station, *Storrs.*[a]

Department of The Connecticut Agricultural College.

GOVERNING BOARD.

Board of Trustees: Gov. George P. McLean (*ex officio Pres.*), *Hartford;* W. E. Simonds (*V. Pres.*), *Hartford;* George A. Hopson (*Sec.*), *Wallingford;* W. D. Holman (*Treas*), *West Willington;* E. S. Henry, *Rockville;* M. M. Frisbie, *Southington;* Edmund Halladay, *Suffield;* E. H. Jenkins, *New Haven;* Geo. S. Palmer, *Norwich;* B. C. Patterson, *Torrington.*

STATION STAFF.

R. W. Stimson, M. A., *Acting President of the College.*
W. O. Atwater, Ph. D., *Dir.* (*Middletown*).
C. S. Phelps, B. S., *V. Dir.; Agr.*
F. E. Singleton, *Sec.* (*Middletown*).
H. W. Conn, Ph. D., *Bact.* (*Middletown*).
W. A. Stocking, jr., B. S. A., *Dairy Experimenter.*
W. M. Esten, M. S., *Asst. in Dairy Bact.* (*Middletown*).

LINES OF WORK.

The work of the Connecticut Storrs Station during the past year has included inquiries in regard to the nutrition of plants, animals, and man, and the bacteriology of the dairy. In connection with the investigations relating to the nutrition of plants, the station has continued rotation tests to study the deficiencies of the soil and the needs of the different crops for the different ingredients of fertilizers; pot and field experiments with corn, cowpeas, soy beans, and other crops for studying the effect of nitrogen in different quantities and combinations upon the yields and composition of the crops; and experiments in soil improvement for the purpose of comparing the relative economy of stable manure, a complete chemical fertilizer, and green manures, alone and in combination with mineral fertilizers, for improving a soil apparently deficient in organic matter and in available nitrogen; and has started a new rotation experiment to study the effects of nitrogenous fertilizers on yields and chemical composition of some of the more common forage crops. The inquiries relating to the nutrition of animals have included an investigation on the rations fed to milch cows by farmers and dairymen in the State, and the effects of the feeding upon milk production. The bacteriological investigations have included a study of the bacteria of the dairy and

[a] Telegraph address, *Storrs via Willimantic;* railroad station, express, and freight address, *Eagleville.*

an investigation on tuberculosis in cows, and the use of the milk of tuberculous cows in feeding calves. The investigations on the food and nutrition of man have included the analysis of food materials, studies of dietaries of different classes of people, digestion experiments with men, determinations of fuel values of food materials by means of the bomb calorimeter, and experiments with men in the respiration calorimeter.

The investigations on the food and nutrition of man have, as heretofore, been aided by special appropriation by the State and are carried on in connection with similar investigations conducted under the auspices of this Office (see p. 437). These investigations, and also the bacteriological investigations have been carried on in Middletown, Wesleyan University giving the use of its laboratories for the purpose. The bacteriological work has been placed in charge of Prof. H. W. Conn, of Wesleyan University, who has been made a member of the station staff and who will direct most of his investigations to the application of bacteriology to dairying. Professor Conn has recently published an important manual on agricultural bacteriology. The new dairy building at Storrs affords better facilities for the station, and dairy work at this place will be considerably extended. Two members of the station staff have assisted at farmers' institutes.

INCOME.

The income of the station during the past fiscal year was as follows:

United States appropriation	$7,500.00
State appropriation	1,800.00
Farm products	115.70
Miscellaneous	12.50
Total	9,428.20

A report of the receipts and expenditures for the United States fund has been rendered in accordance with the schedules prescribed by this Department, and has been approved.

PUBLICATIONS.

The publications of this station received during the past fiscal year were Bulletin 22 and the Annual Report for 1899.

Bulletin 22, pp. 20.—The Soy Bean as a Forage and Seed Crop.—A popular discussion of the culture and uses of this crop based largely upon the results of work at the station.

Annual Report, 1899, pp. 223.—This contains a financial statement for the fiscal year ended June 30, 1899; a report of the director reviewing the work of the station during the year; detailed descriptions, including morphology and cultural and biochemical characteristics, of over 100 species of bacteria isolated from dairy products

during the last ten years, together with an account of the collection of the bacteria, methods of isolation and study, and the classification and naming of the species; discussion of the terms digestibility, availability, and fuel value; a discussion based upon the results of nutrition investigations carried on under the auspices of this Department of the proportion of nutrients supplied by different groups of food materials in the average diet, the availability of different classes of nutrients in food of mixed diet, heats of combustion of nutrients, fuel value, and related topics; tables showing the available nutrients in a large number of animal and vegetable foods; detailed reports of dietary studies with college students, a chemist's family, and a chemist; full data concerning the history of four tuberculous cows and of calves fed upon their milk, with a general summary of the results and practical deductions; results for three years of experiments on corn, cowpeas, and soy beans, to determine the effects of nitrogen in different quantities and combinations; results of a rotation soil test planned to study the deficiencies of soils and the fertilizer requirements of different crops; a brief account of experiments begun in 1899 to test the relative value of stable manure, a complete chemical fertilizer, and green manures, alone and in combination with mineral fertilizers, as means of improving worn-out soils; tabulated analyses of fodders and feeding stuffs; and a monthly summary of meteorological observations during 1899.

GENERAL OUTLOOK.

Among the more important needs of agriculture in the State is a clearer knowledge of the principles of nutrition of both plants and animals. Intensive cultivation of crops and expert management of herds are more and more indispensable to successful farming. It is the effort of the station, therefore, to furnish information concerning these matters. The field experiments are made for the special purpose of studying the particular needs of different soils and crops and the best methods of supplying them with fertilizers. Experiments are also being made to learn the best method of restoring fertility to soils that have long been under cultivation and are lacking in some of the ingredients of plant food. In two lines of investigation—the nutrition of animals and man, and dairy bacteriology—the Storrs Station has done a relatively large amount of high grade work, the results of which are favorably regarded both in the United States and in Europe.

DELAWARE.

The Delaware College Agricultural Experiment Station, *Newark.*

Department of Delaware College.

GOVERNING BOARD.

Board of Trustees—Committee on Agriculture: James Hossinger, *Newark;* Manlove Hayes, *Dover;* W. F. Causey, *Milford;* W. H. Stevens, *Seaford.*

STATION STAFF.

Geo. A. Harter, M. A., PH. D., *President of the College.*
Arthur T. Neale, M. A., PH. D., *Dir. and Agr.*
F. D. Chester, M. S., *Myc.*
C. P. Close, M. S., *Hort.*
C. L. Penny, M. A., *Chem.*
W. H. Bishop, B. S., *Met.*
H. B. Eves, V. M. D., *Vet.*
E. Dwight Sanderson, B. S. A., *Ent.*

LINES OF WORK.

The work of the Delaware Station during the past year has been along the same general lines as heretofore, including chemical studies of soils and sugar beets and sorghum, bacteriological studies of soils, field experiments with sugar beets, varieties of sorghum, and forage crops, especially cowpeas and corn grown with cowpeas; feeding experiments; dairy investigations; studies of diseases of animals and plants; horticultural investigations, principally with the sour cherries of America, apples, and pears; entomological investigations, including studies of injurious insects and experiments with various insecticides and different kinds of apparatus for applying the same. The station is cooperating with the Bureau of Plant Industry of this Department in experiments with cover crops for orchards, and with the Bureau of Chemistry of this Department in studies of the influence of environment on the sugar content of muskmelons.

Two wings are being added to the main college building and the building is being otherwise remodeled. The cost of the improvements will be at least $25,000. The entomologist of the station will have rooms in one of the new wings, and another room will be especially fitted up for photography. These changes will give more room in the station building for the officers who remain there. Farmers' institutes are managed independently by the three counties in the State, each of which receives from the State $200 a year for this purpose, but members of the station staff assist in conducting the meetings. At the close of the fiscal year the horticulturist resigned to accept a position in the Bureau of Plant Industry of this Department, and was succeeded in September by Prof. C. P. Close, of the Utah Agricultural College and Station.

INCOME.

The income of the station during the past fiscal year was as follows:

United States appropriation $15,000

A report of the receipts and expenditures for the United States fund has been rendered in accordance with the schedules prescribed by this Department, and has been approved.

PUBLICATIONS.

The publications of this station received during the past fiscal year were Bulletins 47–52 and the Annual Reports for 1899 and 1900.

Bulletin 47, pp. 30, figs. 12.—Common Diseases of Fowls; Their Control and Treatment.—A general account of the etiology, symptoms, and treatment of the common diseases of poultry.

Bulletin 48, pp. 16, figs. 12.—Top-working Apple Trees.—A popular discussion of the methods and advantages of top-working apple trees.

Bulletin 49, pp. 24, pls. 2, figs. 7.—The Strawberry-root Louse.—The Destructive Pea Louse in Delaware.—Economic and biologic notes on the strawberry-root louse and the destructive pea louse, with a discussion of preventive and remedial measures.

Bulletin 50, folio, figs. 8.—Directions for Treatment of Insect Pests and Plant Diseases.—Brief notes on the common insect enemies and fungus diseases of the more important economic plants, with formulas for making the standard insecticides and fungicides.

Bulletin 51, pp. 24, figs. 5.—Pedigreed Sorghum as a Source of Cane Sugar.—This bulletin gives a comparison of sugar cane, sugar beets, and sorghum as sources of sugar, describes a method of raising sorghum, points out how its value for sugar production is determined, and discusses the machinery needed to extract sorghum sugar, with estimates of its cost and suggestions as to its management.

Bulletin 52, pp. 8, figs. 7.—Pear Blight and Pear Canker.—A discussion of this subject reprinted from the Annual Report of the Station for 1900.

Annual Report, 1899, pp. 257, pls. 2, figs. 29, dgm. 1.—This includes a financial statement for the fiscal year ended June 30, 1899; the organization list of the station; summarized and detailed reports of the work of the different departments during the year; reprints of Bulletins 42, 44–46 of the station; results of fertilizer experiments with basic slag, ground bone, and acid phosphate on rye and grass; results for the fourth year in succession of spraying experiments for the control of apple scab; a report on examinations of cases of suspected anthrax and hog cholera and on tests of commercial hog-cholera serum; studies in systematic bacteriology, including an outline for the study of the subject and a synopsis of the groups of bacteria; descriptions of 9 species of bacteria isolated from cultivated soils; 6 of which are given as new; observations on the chemical functions of certain soil bacteria, including the production of ammonia and the reduction of nitrates to nitrites and the relation of the growth of these organisms to the reaction of the media; data obtained in thinning experiments with plums; an account of spraying experiments with Bordeaux mixture for the prevention of tomato blight; results of tests of several remedies against strawberry-root aphis; observations on the effect of hydrocyanic-acid gas upon strawberry plants; and monthly summaries of meteorological observations during the year.

Annual Report, 1900, pp. 259, pls. 7, figs. 48.—This contains a financial statement for the fiscal year ended June 30, 1900; the organi-

zation list of the station; and departmental reports. The report of the agriculturist includes an account of the development of a dairy herd at the station and a reprint of Bulletin 51 noted above. The report of the mycologist contains results of spraying experiments for the treatment of apple scab; notes on pear blight and on canker in apple and pear trees; reports on cases of pneumonia in a calf, asthenia or going-light of fowls, and entero-hepatitis or blackhead of fowls, including the results of bacteriological investigations in connection with the discussion of each disease; and an account of a bacteriological investigation of drinking water occasioned by a serious outbreak of typhoid fever. The report of the chemist contains an account of work in the selective propagation of sorghum and experiments in planting at different rates, a description of a multiple fat extractor for the rapid determination of fat in milk, a comparison in tabular form of the records of 13 cows belonging to a private herd during 2 lactation periods, and an analysis of a proprietary preparation sold as a "preventive and cure for hog cholera." The report of the horticulturist contains a discussion of the nomenclature of the sour cherries of America and an arrangement of the varieties into 4 groups, the more important varieties under each being described; an account of experiments with Keiffer pears to study the degree of fertility or sterility of the variety, the influence of several different pears used as pollenizers, and the behavior of the variety in different places; and preliminary reports on experiments in thinning Keiffer pears and on pollination experiments with apples. The report of the entomologist contains articles on the strawberry-root louse and the destructive pea louse; biologic and economic notes on a large number of insects injurious to apples, clover, etc.; an account of experiments with crude petroleum as a remedy for the San José scale; and a discussion on hydrocyanic-acid gas as an insecticide for low-growing plants and the diffusion of the gas in an inclosed space. The report of the meteorologist gives monthly summaries of meteorological observations at 6 places in Delaware during 1899 and 1900.

GENERAL OUTLOOK.

The staff of the Delaware Station are doing a relatively large amount of investigational work along lines of practical importance to the agriculture of the State. The director of the station is giving much attention to feeding experiments with heifers for the purpose of finding crops that will furnish protein cheaply. The bacteriologist is making a special study of soil bacteria to determine the relative number of bacteria in different soils and at different depths, the effect of different fertilizers on the number of bacteria in the soil, etc. He has recently published a manual of determinative bacteriology. The entomologist is making special studies of aphids, giving particular attention to the

pea louse and apple lice. He has in press a bulletin giving a summary of information regarding the apple-bud borer, the fruit-tree bark borer, and the 17-year locust; also a book on Insects Injurious to Staple Crops. While most of the members of the staff teach in the college, this work is not made burdensome and they are doing much for the advancement of agriculture in the State.

FLORIDA.

Agricultural Experiment Station of Florida, *Lake City.*

Department of Florida State Agricultural College.

GOVERNING BOARD.

Board of Trustees: G. W. Wilson (*Pres.*), *Jacksonville;* F. E. Harris (*V. Pres.*), *Ocala;* J. D. Callaway (*Sec.*), *Lake City;* C. A. Carson, *Kissimmee;* J. R. Parrott, *St. Augustine;* E. D. Beggs, *Pensacola;* L. Harrison, *Lake City.*

STATION STAFF.

Thos. H. Taliaferro, C. E., Ph. D., *President of the College and Director.*
Horace E. Stockbridge, Ph. D., *Agr.*
H. K. Miller, M. S., *Chem.*
H. A. Gossard, M. S., *Ent.*
H. Harold Hume, M. S., *Bot. and Hort.*
Chas. F. Dawson, M. D., D. V. S., *Vet.*
A. W. Blair, M. A., *Asst. Chem.*
W. P. Jernigan, *Auditor and Bookkeeper.*
John F. Mitchell, *Foreman of Farm.*
J. H. Jefferies, *Foreman of Garden and Orchards.*
Lucia McCulloch, *Asst. Biol. and Asst. Libr.*
Minnie Helvenston, *Sten. and Libr.*

LINES OF WORK.

The work of the Florida Station during the past year has included three principal lines—culture and fertilizer experiments with the staple crops of the State, investigation of the diseases and insect pests of the leading fruits and vegetables, and feeding experiments. The culture and fertilizer experiments have been with forage crops, cassava, sugar cane, sweet potatoes, pecans, pineapples, and citrus fruits. In this connection, also, chemical investigations of water, pineapple soils, and fertilizers have been made. Among plant pests and diseases the white fly and the tent method of repression, scale insects, and diseases of cucumbers, cantaloupes, lettuce, and potatoes have been subjects of special study. Cassava, velvet bean, and the beggar weed have been used in combination with cotton-seed meal, corn, hay, etc., in digestion experiments with steers and cows, and the feeding experiments with razor-back pigs have been continued. Extensive experiments with pineapples, which were given up a year ago, have been resumed recently.

The Florida Station is studying methods of analyzing phosphoric acid and pineapples in cooperation with the Bureau of Chemistry of this Department, and conducting experiments with hybrid oranges in

cooperation with the Bureau of Plant Industry of this Department. The Bocaraton fruit plantation is well started, having been planted about a year ago to different kinds of citrus fruits, on which a resident superintendent directed by the station horticulturist will conduct fertilizer experiments and experiments in rendering citrus fruits dormant so as to resist frost. The land in charge of the station near Lake City will henceforth be used for rotation and pasture experiments and the growing of forage for feeding experiments. The legislature of the State at its last session appropriated $5,000 for the support of a veterinary department for the college and station during the next two years, $5,000 for farmers' institutes, and $10,000 for a model farm to be conducted by the college. Dr. Charles F. Dawson, formerly of the Bureau of Animal Industry of this Department, has been appointed veterinarian. During the year Dr. W. F. Yocum, president of the college and director of the station, resigned, and Dr. T. H. Taliaferro, formerly of Pennsylvania State College, has been appointed to succeed him.

INCOME.

The income of the station during the past fiscal year was as follows:

United States appropriation	$15,000.00
Farm products	863.67
Total	15,863.67

A report of the receipts and expenditures for the United States fund has been rendered in accordance with the schedules prescribed by this Department, and has been approved.

PUBLICATIONS.

The publications of this station received during the past fiscal year were Bulletins 54, 55, and the Biennial Report for 1899 and 1900.

Bulletin 54, pp. 31, pls. 3, figs. 9.—Pecan Culture.—The botany, methods of propagation and culture, varieties, and the adaptation of pecans to Florida conditions are considered. Some notes on the production of new varieties by crossing are given, and 18 varieties grown either in Florida or Georgia are described.

Bulletin 55, pp. 96, pls. 12, fig. 1, dgm. 1.—Feeding with Florida Feed Stuffs.—The conditions which govern stock feeding in Florida are described, the general principles of feeding are discussed, feeding experiments with steers and pigs in which comparisons were made of different feeding stuffs are reported in detail, and the results of an experiment with a steer to determine the digestibility of cassava are given.

Biennial Report, 1899 and 1900, pp. 76, pls. 4, figs. 9.—This contains a report of the director reviewing the different lines of station

work and giving notes on the station staff and station equipment; financial statements for the fiscal years ended June 30, 1899 and 1900; a report of the agriculturist giving results of various culture and fertilizer experiments; a report of the chemist summarizing the work of the department during the two years; a report of the botanist and horticulturist giving a brief account of citrus experiments under way, pecan culture in Florida, and of three native plants for decorative purposes—the Atamasco lily, sparkleberry, and sumac; descriptive and historical notes on the downy mildew of the cucumber, with the results of experiments conducted for the repression of this disease; notes on three diseases of celery, with suggestions as to treatment, and a list of about 70 species of fungi collected in Florida; and a report of the entomologist giving notes on a large number of insects observed during the two years, with the results of several experiments for their repression.

GENERAL OUTLOOK.

The station management is directing its efforts toward the development of the fruit industry, cattle raising, and dairying. The pineapple industry is growing rapidly and presents several troublesome problems which the station should endeavor to solve. Among these problems is that of discovering a remedy for root blight, which is very troublesome, and that of keeping the land in good condition for this crop. There is need of a thorough study of the physical and other conditions of pineapple soils. Citrus fruits and sugar cane are also important crops and are receiving considerable attention from the station. The feeding experiments and the rotation and fertilizer experiments with forage crops have been conducted with a view to developing the cattle-raising industry, especial efforts being directed toward obtaining breeds of cattle thoroughly adapted to the Florida climate, both for beef and dairy purposes. The recent appropriations made by the legislature will enable the station to considerably extend its usefulness in veterinary science, and also to develop the farmers' institute movement which the college has been carrying on unaided for several years. The increased liberality of the State to this institution is very encouraging, and will, it is hoped, favorably affect the station in a number of ways. Owing to the fact that the college is located outside of the chief fruit growing region of the State, it is very desirable that the experiments in other localities, especially those with pineapples and citrus fruits, should be put on a thoroughly efficient basis. For this purpose it is essential that the officers in charge of this work should be in a position to be absent from Lake City whenever the needs of their experimental work elsewhere demand.

GEORGIA.

Georgia Experiment Station, *Experiment.*[a]

Department of Georgia State College of Agriculture and Mechanic Arts.

GOVERNING BOARD.

Board of Directors: O. B. Stevens (*Pres.*), *Atlanta;* J. B. Park, jr., (*Sec. and Treas.*), *Greensboro;* Walter B. Hill, *Athens;* H. C. White, *Athens;* G. M. Ryals, *Savannah;* P. E. Boyd, *Leary;* J. T. Ferguson, *Leesburg;* J. H. Mobley, *Hamilton;* A. J. Smith, *Conyers;* N. B. Drewry, *Griffin;* Felix Corput, *Cavespring;* John Deadwyler. *Maysville;* John Gilmore, *Warthen;* William Henderson, *Ocilla.*

STATION STAFF.

H. C. White, C. E., Ph. D., *President of the College.*

R. J. Redding, *Dir.*
H. C. White, C. E., Ph. D., *V. Dir.; Chem.*
S. H. Fulton, B. S., *Biol. and Hort.*
J. M. Kimbrough, *Agr.*
Wm. F. Fiske, *Asst. Ent.*
Claude L. Willoughby, *Dairyman.*
Miss J. M. Heyfron, *Sten. and Accountant.*
C. A. Mosier, *Supt. Hort. Grounds.*

LINES OF WORK.

At the Georgia Station the work of the past year has been mostly along the same lines as in former years, including variety, fertilizer, and culture experiments with corn, cotton, fruits, and vegetables; feeding experiments and dairy work, and study of remedies for crown knot, brown rot, and other plant diseases. Considerable attention has been given to experiments in spraying, with special reference to the more general use of this practice in Georgia. Following tests of a large number of varieties of grapes, a new vineyard is being established to include only those varieties found to be desirable for Georgia, and with a view to restricting the work of the station hereafter chiefly to experiments with these varieties. The station has cooperated with this Department in experiments on grasses, races of peaches, fertilizers for melons in southern Georgia, and the spraying of peaches in western Georgia. During the year a new plant house has been completed. A. L. Quaintance, biologist and horticulturist, has recently resigned to accept the position of entomologist in the Maryland Agricultural Experiment Station, and has been succeeded by S. H. Fulton, formerly superintendent of the South Haven, Mich., substation.

INCOME.

The income of the station during the past fiscal year was as follows:

United States appropriation	$15,000.00
State appropriation	750.00
Farm products	2,361.48
Miscellaneous, including balance	2,935.71
Total	21,047.19

[a] Telegraph, express and freight address, *Griffin.*

A report of the receipts and expenditures for the United States fund has been rendered in accordance with the schedules prescribed by this Department, and has been approved.

PUBLICATIONS.

The publications of this station received during the past fiscal year were Bulletins 49–52 and the Annual Report for 1900.

Bulletin 49, pp. 56, pl. 1.—Practical Dairying.—This bulletin contains a popular discussion of dairy cows in regard to breed and type; care of cows, stable management, milking, separating and ripening cream, churning, butter making, cheese making, feeding, dehorning, and the calculations of rations; feeding standards and analyses of feeding stuffs; rations suggested for milch cows and for fattening steers; the results of experiments conducted for several years to ascertain the cost of milk and butter production; brief general notes on dairying in Georgia and on the selection of a dairy herd; and suggestions on the destruction of cattle ticks for preventing the development of Texas fever in Northern cattle imported into the South.

Bulletin 50, pp. 37, pls. 3, figs 6.—The Brown Rot of Peaches, Plums, and other Fruits.—Investigations on this disease, due to *Monilia fructigena*, are reported. The life history of the fungus was studied and spraying experiments for the prevention of the disease were conducted.

Bulletin 51, pp. 24.—Corn Culture.—A detailed account of culture, variety, seed, and fertilizer experiments with corn in continuation of similar work previously reported. Weather conditions during the growing season are given.

Bulletin 52, pp. 32.—Cotton Culture.—Variety, seed, culture, and fertilizer experiments with cotton are reported in detail. The tests included mixing the seed of an early and a late variety of cotton, planting at different distances, and a comparison of different methods of applying fertilizers.

Annual Report, 1900, pp. 77, pls. 10.—This includes a report of the director on the publications and work of the station during the year; a financial statement for the fiscal year ended June 30, 1900, and a report of the biologist and horticulturist, containing notes on different varieties of peaches and plums; a report on work with grapes, including a study of the degree of self-fertility and a test of the keeping qualities of different varieties; a study of the effects on the fruit of ringing grapevines; a comparison of methods of training, and analyses of different varieties with reference to the sugar content of the juice; results of tests of a number of varieties of cantaloupes, onions, and celery; analyses of 43 varieties of sweet potatoes; notes on the development of the fruit buds of the peach; and rather extended notes on

a large number of the more injurious plant diseases and insects noted by the author during the year.

GENERAL OUTLOOK.

The operations of the station continue to be directed largely to the improvement of cotton and corn, the two staple crops of the State, and yet considerable attention is given to the development of horticultural interests, especially the growing of peaches. The dairy work has been illustrative in nature, but now that the station has demonstrated the suitability of the State for dairying, it is planned to put the work on an experimental basis. The station officers attend horticultural and other meetings, but farmers' institutes as such are not yet organized in the State, though they are much needed.

HAWAII.

Hawaii Agricultural Experiment Station, *Honolulu.*

Under the supervision of A. C. True, Director Office of Experiment Stations, United States Department of Agriculture.

STATION STAFF.

Jared G. Smith, *Special Agent in Charge.*
T. F. Sedgwick, *Agr.*
Frank E. Conter, *Farm Foreman.*

LINES OF WORK.

The work of the Hawaii Experiment Station during the past year has been confined mostly to surveying and clearing land, the erection of buildings, and the organization of a staff. The only experimental work attempted was the inauguration of a cooperative experiment with taro (*Colocasia antiquorum*) for the purpose of studying a blight which causes losses amounting sometimes to as high as 90 per cent of the crop. The station has been called upon for considerable advice by correspondence and has prepared a bulletin on sorehead and other diseases of poultry, which are very troublesome in Hawaii.

INCOME.

The appropriation for the Hawaii Experiment Station for the fiscal year ended June 30, 1901, was $10,000. For the current fiscal year it is $12,000.

GENERAL OUTLOOK.

Subsequent to the visit of Dr. W. C. Stubbs to the Hawaiian Islands as special agent from this Department and the publishing of his report, Mr. Jared G. Smith, of this Department, was appointed special agent in charge of the Hawaii Experiment Station, March 1, 1901. Mr. Smith arrived in Honolulu April 5, and immediately began making preliminary surveys of the land selected by Dr. Stubbs for

the use of the station. This land was formally transferred to the United States June 10, and comprises 154 acres known as the Kewalouka tract in Makiki Valley adjacent to the city of Honolulu. It is nearly 2 miles long and varies in width from about 300 yards at its lowest portion (125 feet above sea level) nearest the city to about 100 yards at the upper end (1,350 feet above sea level).

The work of clearing land and erecting buildings began in May. Two lots were cleared of timber, one of 24 acres near the lower end and one of 13 acres at the upper end of the reservation. In addition 20 acres on the slope above the station buildings were roughly cleared of guava and lantana to allow the grass to grow for pasturage. The buildings erected include an office, a residence containing six rooms, a cottage for laborers, 2-story stable, poultry house, manure shed, and a small storehouse for dynamite. A water system connected with the city water system was installed by the station and tanks were constructed at convenient places for fire protection, irrigation, and other purposes.

At the upper clearing about 1½ acres have been dug over and terraced and a cottage containing two rooms for laborers and a tool room has been erected. This structure is roofed with corrugated galvanized iron which projects 4 feet to give a large surface for collecting rain water. The water thus collected is stored in a large tank which is connected by pipes with the terrace where the water will be used.

Owing to lack of funds it has been impracticable as yet to conduct experiments to any extent on the station farm, but it is the intention to begin experiments with potatoes, corn, tobacco, coffee, and other crops and studies of problems in animal husbandry as soon as possible. Taro is the staple food of the native Hawaiians, hence the experiments to discover a method of protecting it from blight are considered of great immediate importance. Investigations are being made of the agricultural conditions in the different islands, with a view to planning the future operations of the station to meet the needs of different regions.

Hawaiian Sugar Planters' Experiment Station, *Honolulu.*

GOVERNING BOARD.

Trustees of Hawaiian Sugar Planters' Association.

STATION STAFF.

C. F. Eckart, *Dir. and Chem.*
E. J. Lea, B. S., *Asst. Chem.*
S. S. Peck, B. S., *Asst. Chem.*
E. G. Clarke, *Field Asst.*

The work of this station during the past year has been confined closely to investigations bearing on the sugar industry in its various branches. These investigations involve studies of the fertilizer requirements of different soils, irrigation investigations, physical and

chemical analyses of soils, variety tests, fertilizer and culture experiments with sugar cane, and studies of the technology of sugar manufacture.

The station has been maintained as heretofore by the Sugar Planters' Association. The director, R. E. Blouin, has recently resigned to return to the station at New Orleans, and has been succeeded by C. F. Eckart, formerly first assistant chemist of the station.

IDAHO.

Agricultural Experiment Station of the University of Idaho, *Moscow.*

Department of the University of Idaho.

GOVERNING BOARD.

Board of Regents: John B. Goode (*Pres.*), *Rathdrum;* Mrs. Wm. H. Ridenbaugh (*V. Pres.*), *Boise;* Geo. C. Parkinson (*Sec.*), *Preston;* George W. Chapin, *Idaho Falls;* Henry E. Wallace, *Caldwell.*

STATION STAFF.

J. A. McLean, PH. D., *President of the University and Director.*

Louis F. Henderson, PH. B., *Bot.*
John M. Aldrich, M. S., *Ent.*
John E. Bonebright, M. A., *Met.*
Fred A. Huntley, B. S. A., *Hort.*
Hiram T. French, M. S., *Agr.*
Chas. A. Peters, B. S., PH. D., *Chem.*
Chas. N. Little, M. A., PH. D., *Irrig. Engin.*
Hal. T. Beans, M. S., *Asst. Chem.*
Herbert T. Condon, *Clerk.*

William L. Payne, *Treas.*

LINES OF WORK.

The work of the Idaho Station during the past year has included feeding experiments with steers and lambs; experiments with tame grasses to determine their value for pasturage, and with clover and a number of grasses for hay; tests of the yield and growth of barley, corn, macaroni wheats, soy beans, broom-corn millet, spelt, and Russian grains; botanical work, including studies of mushrooms and the fungus diseases of the grape, peach, and pear, and experiments with different spraying materials; chemical investigation of insecticides and fungicides; analysis of soils, feeding stuffs, prunes, ores, and miscellaneous articles; study of the nitrogen content of wheat; sugar-beet investigations; studies of the San José scale, elm louse, pear-leaf blister mite, grasshoppers, and other insects; spraying experiments with insecticides; horticultural investigations, including experiments in the cultivation and pruning of fruit trees, the use of barnyard manure in the production of root crops, experiments in growing garden vegetables with and without irrigation, and experiments in root pruning to hasten the ripening of beans; meteorological observations.

The feeding experiments have been conducted with a view to encouraging animal production in a region where continuous wheat raising has been practiced almost exclusively. Already considerable

interest has been aroused in this and in the growing of forage plants and grasses for the purpose. In this connection experiments are being made with different kinds of pasture grasses and clovers for sheep, the sheep being hurdled on small tracts. The sugar-beet investigations have included cooperative experiments with 80 farmers in the Payette Valley, an irrigated district in southern Idaho, for the purpose of testing the economic value of the sugar beet in that region. In May of the present year phylloxera was discovered on grapevines at Julietta and prompt quarantine measures were taken. The station has begun investigations of the codling moth in cooperation with the Division of Entomology of this Department. The State has given the university $50,000 for the erection of a girls' dormitory and a science hall, and $1,000 a year for two years to support farmers' institutes. During the year a piggery (Pl. II, fig. 2) was erected on the station farm and other minor improvements were made. In the department of chemistry Dr. Charles A. Peters succeeded Dr. Avery, and in that of irrigation engineering Dr. Charles N. Little, late of Leland Stanford Junior University succeeded Arthur P. Adair.

INCOME.

The income of the station during the past fiscal year was as follows:

United States appropriation	$15,000
Farm products	1,500
Total	16,500

A report of the receipts and expenditures for the United States fund has been rendered in accordance with the schedules prescribed by this Department, and has been approved.

PUBLICATIONS.

The publications of this station received during the past fiscal year were Bulletins 24–27.

Bulletin 24, pp. 18.—Cattle Feeding.—Crop Tests.—A feeding experiment with 12 steers, to determine the profit in fattening steers, under local conditions, is reported, and notes and tabulated data are given on the culture and test of varieties of potatoes, millet, and rape at the station.

Bulletin 25, pp. 11.—The Composition of Arsenical Insecticides.—Results of analyses of 19 samples of Paris green obtained from dealers in different parts of the State, with notes on various other arsenical insecticides.

Bulletin 26, pp. 12.—Crude Petroleum.—The Elm Louse.—The Pear-leaf Blister Mite.—Spraying experiments with crude petroleum for the destruction of San José scale and plant lice are reported and

directions given for the preparation of crude petroleum emulsion, and notes are given on the life history and habits of the elm aphis and the pear-leaf blister mite, with the results of experiments for their destruction.

Bulletin 27, pp. 40, pls. 10.—fig. 1.—Mushrooms or Toadstools.—Descriptions are given of a number of the more common mushrooms, with directions for their identification. Notes are given on the value of mushrooms as food, and a number of recipes for preparing them for the table, taken from various sources, conclude the bulletin.

GENERAL OUTLOOK.

In Idaho, as in other Western States where the single-crop method of farming largely prevails, the introduction of greater diversity by demonstrating the adaptability of the region to the production of live stock, fruit, and untried field crops, is work of the greatest immediate importance, and such is the principal work of this station. Corn is a crop that it was supposed would not ripen in northern Idaho, but after repeated efforts the station has succeeded in finding a variety that will mature. Sugar-beet production is being encouraged by cooperative experiments in southern Idaho, and plans have been made for conducting more extensive irrigation experiments in the same region. The station has succeeded in arousing considerable interest in stock feeding among the farmers, and a number of them are taking up stock raising. During the year 6 members of the staff have engaged in farmers' institute work, and in spite of the scattered population and the difficulties of travel, encouraging meetings were held and considerable interest in the work of the station aroused. It is encouraging to find that this work is sufficiently appreciated to have the State legislature make a special appropriation for its future maintenance. This station should be organized more definitely as a distinct department of the university and be placed in immediate charge of an expert director, with a view to concentrating its efforts on a few lines of great importance to the agriculture and horticulture of the State and pushing its investigations energetically in accordance with a well-considered plan.

ILLINOIS.

Agricultural Experiment Station of the University of Illinois, *Urbana.*

Department of the University of Illinois.

GOVERNING BOARD.

Board of Trustees of the University: Governor Richard Yates, *Springfield;* Martin Conrad, *48 West Monroe street, Chicago;* Alfred Bayliss, *Springfield;* Mrs. Mary T. Carriel, *Jacksonville;* Francis M. McKay, *61 Alice court, Chicago;* Thos. J. Smith (*Pres.*), *Champaign;* Mrs. Alice A. Abbott, *Champaign;* Frederic L. Hatch, *Spring Grove;* Augustus F. Nightingale, *1997 Sheridan road, Argyle Park, Chicago;* Alexander McLean, *Macomb;* Samuel A. Bullard, *Springfield;* Mrs. Carrie T. Alexander, *Belleville.*

STATION STAFF.

Andrew S. Draper, LL. D., *President of the University.*

Eugene Davenport, M. Agr., *Dir.*
T. J. Burrill, Ph. D., *Bot.*
S. A. Forbes, Ph. D., *Ent.*
D. McIntosh, V. S., *Vet.*
C. G. Hopkins, Ph. D., *Agron. and Chem.*
J. C. Blair, *Hort.*
H. W. Mumford, B. S., *Animal Husb.*
W. J. Fraser, B. S., *Dairying.*
G. P. Clinton, M. S., *Bot.*
A. D. Shamel, B. S., *Farm Crops.*
L. H. Smith, B. S., *Chem.*
J. W. Lloyd, B. S. A., *Hort.*
H. E. Ward, M. S., *Chief Asst. in Soil Bact.*
A. J. Glover, B. Agr., *Chief Asst. in Dairy Husb.*
W. H. Knox, M. S., *Chief Asst. in Soil Phys.*
C. F. Hottes, Ph. D., *Asst. in Bot.*
J. H. Skinner, B. S., *Asst. in Animal Husb.*
A. V. Stubenrauch, B. S., M. S. A., *Asst. in Hort.*
H. Hasselbring, B. S., *Asst. in Veg. Path.*
J. H. Petitt, Ph. B., *Asst. in Chem.*
E. M. East, B. S., *Asst. in Chem.*
C. P. Bull, B. Agr., *Asst. in Farm Crops.*
R. S. Woodrow, *Field Asst. in Sugar Beet Investigations.*
Kate McIntyre, *Sec.*
F. H. Rankin, *Institute Visitor.*

LINES OF WORK.

The work of the Illinois Station during the past year, as heretofore, has included investigations in agronomy, horticulture, chemistry, botany, entomology, and animal industry and dairying. The work in agronomy has included rotation and fertilizer experiments to study the needs of the soils, soil inoculation experiments, experiments in selecting corn to improve the protein and fat, and sugar-beet investigations. In horticulture the principal work has been with the apple, and has included the cultivation of orchards, spraying, tests of spraying machinery, experiments with new insecticides and fungicides, pruning work at the station and in private orchards, renovation experiments in an old orchard near the station, and the use of commercial fertilizers and cover crops in the orchard. There have also been experiments with pears and garden vegetables, cold-storage investigations, and studies of the causes that determine quality in muskmelons. The chemist has cooperated with the other departments in studies on corn and muskmelons. The botanist has studied the bitter rot of apples, pear blight, and other diseases of fruits. The entomologist is studying particularly the insects that cause damage to the appearance of fruits and those injuring shade trees. In the latter work he has a man engaged in the parks of Chicago. Work in dairying has been continued along the same lines as formerly, but plans are being made for enlarging this and other work in animal husbandry.

The State legislature of 1900–1901 made liberal appropriations for the college of agriculture and the experiment station, increasing the funds available for agricultural education and research by $60,000 annually, besides making a special appropriation of $10,000 for equipping the new agricultural building. Of the former sum the college of agriculture received $8,000 for the purchase of live stock and $6,000

for additional instruction, and the station received $46,000 for special investigations, as follows: $16,000 for investigations in animal husbandry, including feeding experiments; $10,000 for experiments with corn; $10,000 for soil investigations; $10,000 for orchard work, including the study of insect pests and fungus diseases; $5,000 for dairy investigations, and $3,000 for sugar-beet investigations. The law making the above appropriations provides for the appointment, by certain farmers' associations, of committees to confer with the director of the station on the lines of work to be undertaken, but these committees have no power to dictate as to the details of the investigations. The purpose of the promoters of the measure was to secure cooperation between the farmers and the station, and this feature has been given prominence in organizing the work. Investigations of present conditions of agriculture in the State will be followed by cooperative experiments and demonstration work in different parts of the State, while at the same time the staff is engaged in research work at the station.

In providing the organization to undertake this additional work no new departments were created, but 12 additions to the staff were made. Prof. H. W. Mumford, formerly professor of agriculture in the Michigan Agricultural College, was made chief of the department of animal husbandry, to relieve the director of the details of this work. He will devote his attention to cattle, while an assistant will take up work with horses. In the departments of agronomy, horticulture, botany, and dairy husbandry numerous changes and additions were made, all being along the line of greater specialization. Each department is given a stenographer and record keeper, and considerable attention is being given to systematizing the keeping of records. The large amount of cooperative work contemplated necessitated the appointment of some one to look after the interests of the station in different parts of the State, and Mr. F. H. Rankin was appointed institute visitor to act in this capacity. From the nature of their work other members of the staff also are compelled to spend much of their time away from the station. The advisory board of the station has been abolished. A new feature in the means for disseminating information is a series of circulars which are prepared from time to time and distributed.

INCOME.

The income of the station during the past fiscal year was as follows:

United States appropriation	$15,000.00
Fees	350.00
Farm products	344.93
Balance from previous year	663.46
Total	16,358.39

A report of the receipts and expenditures for the United States fund has been rendered in accordance with the schedules prescribed by this Department, and has been approved.

PUBLICATIONS.

The publications of this station received during the past fiscal year were Bulletins 60–65 and the Annual Report for 1900.

Bulletin 60, pp. 135, pls. 9, figs. 97.—The Economic Entomology of the Sugar Beet.—Brief compiled accounts of the habits, life histories, and means of combating about 150 species of insects known to attack sugar beets in the United States, with a bibliography of the subject.

Bulletin 61, pp. 16, pl. 1, figs. 5.—The Farmer's Vegetable Garden.—An account of the cost, care, and production of a small garden planted at the station and well cared for throughout the season.

Bulletin 62, pp. 12.—The Market Classes of Horses.—Road, carriage and coach, cab, bus, and draft horses and trotters are described and their uses pointed out.

Bulletin 63, pp. 28, pls. 12, fig. 1, map 1.—Seed Corn and Some Standard Varieties for Illinois.—This bulletin treats of the necessary qualities of seed corn, presents a list of the various characteristics of corn by which varieties may be systematically studied, and describes a number of varieties adapted to Illinois conditions. Abstracts from the constitution and by-laws of the Illinois Seed Corn Breeders' Association are appended.

Bulletin 64, pp. 16, pls. 6.—Treatment of Oats for Smut.—Notes are given on the amount, nature, and treatment of oat smut, and experiments in treating seed with hot water and formalin are reported.

Bulletin 65, pp. 21, fig. 1.—Construction and Care of Earth Roads.—A popular discussion of this subject under the heads of construction, maintenance, and administration.

Annual Report, 1900, pp. 15.—A brief statement of the principal lines of station work, a subject list of the bulletins issued since the organization of the station, a detailed financial statement for the fiscal year ended June 30, 1900, and the organization list of the station.

GENERAL OUTLOOK.

The past year has been one of reorganization at the Illinois Station. Lines of work already in progress were continued, but the increased facilities and funds for education and research necessitated the reorganization of the different departments and the planning of a large amount of new work. For example, the department of agronomy will undertake breeding experiments with corn and sugar beets, and at the same time greatly extend its investigations in other directions. The department of horticulture will inaugurate cooperative orchard work all over the State, and give more attention than formerly to the

investigation of cold-storage problems. For this latter work one cold-storage house is being erected and three cellars are being refitted, one in the northern, one in the central, and one in the southern part of the State.

No stronger evidence could be shown of the popular favor aroused by the work of the station than the fact that very liberal appropriations were freely made by the legislature last winter. The station now has its work well organized, and with the funds at its disposal is in a position to accomplish very great good for the farming interests of the State. It is very encouraging to have the needs of the experiment station as a research department definitely recognized in the financial budget of the university.

INDIANA.

Agricultural Experiment Station of Indiana, *Lafayette.*

Department of Purdue University.

GOVERNING BOARD.

Board of Trustees: William V. Stuart (*Pres.*), *Lock Box 37, Lafayette;* E. A. Ellsworth (*Sec.*), *Lafayette;* J. M. Fowler (*Treas.*), *Lafayette;* William A. Banks, *Laporte;* Sylvester Johnson, *Irvington;* D. E. Beem, *Spencer;* Job H. Van Natta, *Lafayette;* William H. O'Brien, *Lawrenceburg;* James M. Barrett, *Fort Wayne;* Charles Downing, *Greenfield;* C. B. Stemen, *Fort Wayne.*

STATION STAFF.

Winthrop E. Stone, M. A., Ph. D., *President of the University.*

Charles S. Plumb, B. S., *Dir.*
James Troop, M. S., *Hort.*
Henry A. Huston, M. A., A. C., *Chem.*
Joseph C. Arthur, D. S., *Bot.*
A. W. Bitting, D. V. M., *Vet.*
William Stuart, M. S., *Assoc. Hort.*
Herman Dorner, B. S., *Asst. Bot.*
F. S. Johnston, B. S. *Asst. Agr.*
A. N. Hume, *Half-time Asst.*
H. E. Van Norman, B. S., *Dairyman.*
R. C. Obrecht, B. S. Agr., *Supt. Farm.*

LINES OF WORK.

The work of the Indiana Station during the past year has been mainly along the lines noted in previous reports and has included cultural and fertilizer experiments with cereals and forage crops; rotation experiments; vegetation house trials with cowpeas and soy beans in soils inoculated and not inoculated with nitrifying bacteria, and with corn and oats in soils treated with Alinit; experiments with formalin and hot water for smut of wheat; feeding experiments with hogs and dairy cows, including pasturage *v.* no pasturage for the former and soiling *v.* pasturage for the latter; veterinary investigations, especially studies of milk fever, changes in genitive organs during gestation, and sanitary milk inspection; variety tests of fruits and vegetables and cross fertilization of apples; chemical work, including investigations on the nitrogen-free extracts of feeding stuffs, sugar-beet inves-

tigations, study of losses in curing and keeping corn fodder in the field, and fertilizer experiments with tomatoes. The Indiana fertilizer law, the execution of which is in the hands of the station chemist, has been so amended as to give the chemist complete control of the fertilizer trade. Some investigations have been made on the unproductive soils of the State, which show the need of underdraining, aeration, and fertilizers. The station is cooperating with the Bureau of Chemistry of this Department in sugar-beet investigations, studies on the gluten content of wheat, and an investigation of the influence of environment on the sugar content of muskmelons.

The Indiana legislature has appropriated $60,000 to the university for a new agricultural building which is in process of erection and $10,000 a year for two years for maintenance, besides increasing the fund for farmers' institutes from $5,000 to $10,000 a year. The new agricultural building will not be used by the station, but will indirectly afford the station more room in the building it now occupies. The agriculturist has been relieved of station work to devote himself to teaching and the superintendence of farmers' institutes, and the assistant agriculturist has been appointed to succeed him. The horticulturist has been given an assistant to have charge of work with vegetables, and several other changes have been made which will increase the efficiency of the staff. The veterinarian, on the other hand, has been appointed State veterinarian, which will take considerable of his time from the station.

INCOME.

The income of the station during the past fiscal year was as follows:

United States appropriation	$15,000.00
Farm products, including balance from previous year	2,032.67
Total	17,032.67

A report of the receipts and expenditures for the United States fund has been rendered in accordance with the schedules prescribed by this Department, and has been approved.

PUBLICATIONS.

The publications of this station received during the past fiscal year were Bulletins 82–87 and the Annual Report for 1900.

Bulletin 82, pp. 14.—Roots and Other Succulent Food for Swine.—A discussion of the value of succulent materials for the winter feeding of pigs, with the results of tests of the use of sugar beets, artichokes, and purslane for this purpose.

Bulletin 83, pp. 8.—Tests of Small Fruits.—Data for tests of 82 varieties of strawberries, 32 raspberries, 18 blackberries, and 1 dewberry.

Bulletin 84, pp. 28, pls. 3, dgms 3.—Growing Lettuce with Chemical Fertilizers.—A brief review of earlier work and the results of pot experiments with lettuce to compare the efficiency of chemical fertilizers and stable manure, the availability of liquid chemical manures when applied to the surface of the soil and from below, and surface *v.* subwatering.

Bulletin 85, pp. 8.—Chrysanthemum Rust.—Notes on the occurrence of chrysanthemum rust in Indiana, the appearance of the disease, and on experiments to infect related species with this fungus.

Bulletin 86, pp. 8.—On the Amount of Water in Slop Fed Fattening Pigs.—A comparison with 12 pigs of feeding grain dry and mixed with different amounts of water.

Bulletin 87, pp. 26.—Formalin as a Preventive of Oat Smut.—Results of observations and experiments for three years on the use of formalin for the prevention of oat smut, including comparisons of hot water and formalin for this purpose, determinations of the formaldehyde content of commercial formalin, and tests of the effect of formalin treatment on the yield of grain.

Annual Report, 1900, pp. 104, pl. 1, fig. 1.—This contains a report of the director in which the different lines of station work are enumerated; an account of the occurrence and life history of the asparagus rust with suggestions as to treatment; notes on a disease of beets; details and results of experiments on the prevention of loose smut of wheat by formalin and hot water, and the prevention of millet smut by formalin; an account of a study of corn smut made with special reference to the presence of alkaloids, and the physiological effect of smut upon horses; observations on a bacterial disease of tomatoes; statistics on losses from hog cholera and swine plague in Indiana, together with observations on the relation of hog diseases to water supply and to transportation; results of experiments to determine the length of time during which the hog-cholera bacillus may persist in a virulent condition in infected premises, and observations on the relation of the age of swine to the virulence of infection; statistics on the prevalence of sheep scab in the State; a report of 3 outbreaks of rabies affecting dogs, sheep, pigs, horses, and cows; tabulated data and results of fertilizer and culture tests with 12 varieties of tomatoes; a brief statement concerning the distribution of the San José scale in Indiana; analyses of 6 samples of muck and 10 of marl, with a discussion of the occurrence in the State and the utilization of these substances; comparative analyses of normal sugar beets and beets having one or more protuberances on the upper portion of the roots; miscellaneous chemical analyses; results of experiments in sowing clovers at different dates and of culture and variety tests with cowpeas, soy beans, sorghum, and corn; list of exchanges; and a financial statement for the fiscal year ended June 30, 1900.

GENERAL OUTLOOK.

In a number of lines the Indiana Station is investigating problems of vital importance to the agricultural interests of the State. The work with swine is a leading feature of its work, and the swine interests in the State are very large. The station has a good equipment for these investigations and its work is taking a prominent place. Notable among other investigations are those on sugar beets; in veterinary science; the study of unproductive soils, of which there is a large tract; studies of the influence of plant foods on vegetables and on the blossoming of plants, in which line it has done some of its best work. The display of weather signals on the rural free mail-delivery wagons has been introduced by the station and has proven a very popular innovation. The station cooperates in farmers' institute work, which is in charge of the professor of agriculture in the college.

The appropriation for a fine agricultural building, the increase for maintenance, and the increased appropriation for farmers' institute work indicate a growing appreciation of the work of the college and station, and are especially hopeful signs, because the State has heretofore done very little directly for the agricultural department of the university. The station is doing much good work of direct benefit to the farmers and horticulturists in the State, and the present movement toward strengthening the different departments will increase its efficiency.

IOWA.

Iowa Agricultural Experiment Station, *Ames.*

Department of Iowa State College of Agriculture and Mechanic Arts.

GOVERNING BOARD.

Board of Trustees: Gov. A. B. Cummins, *Des Moines;* R. C. Barrett (*Supt. of Public Instruction*); W. O. McElroy, *Newton;* E. W. Stanton (*Sec.*), *Ames;* Herman Knapp (*Treas.*), *Ames;* W. K. Boardman, *Nevada;* W. J. Dixon, *Sac City;* E. A. Alexander, *Clarion;* C. L. Gabrilson, *New Hampton;* J. B. Hungerford (*Chair.*), *Carroll;* W. R. Moninger, *Galvin;* James H. Wilson, *Menlo;* S. H. Watkins, *Libertyville;* C. S. Barclay, *West Liberty;* W. B. Penick, *Tingley.*

STATION STAFF.

W. M. Beardshear, M. A., LL. D., *President of the College.*

C. F. Curtiss, M. S. A., *Dir.; Agr.*
James Wilson,[a] *Dean of Agr.*
J. B. Weems, B. S., PH. D., *Agr. Chem.*
L. H. Pammel, B. AGR., M. S., *Bot.*
H. E. Summers, B. S., *Ent.*
W. J. Kennedy, B. S. A., *Animal Husb.*
Joseph J. Edgerton, B. AGR., *Asst. in Agr. Phys.*
C. E. Gray, B. S. AGR., *Asst. Chem.*
John J. Repp, D. V. M., *Vet.*
James Atkinson, B. S. A., *Asst. Agr.*
Jos. E. Guthrie, *Asst. Ent.*
G. L. McKay, *Dairying.*
Homer C. Price, *Hort.*
F. R. Marshall, B. S. A., *Asst. in Animal Husb.*
Miss C. M. King, *Ent., Bot., and Hort. Artist.*
E. E. Little, B. S. A., *Asst. Hort.*
A. T. Erwin, *Asst. Hort.*
Miss A. Estella Paddock, B. S., *Asst. in Bot.*

[a] Granted an indefinite leave of absence.

FIG. 1.—IOWA COLLEGE AND STATION—HORSE BARN AND JUDGING PAVILION.

FIG. 2.—IOWA COLLEGE AND STATION—DRAFT HORSES.

LINES OF WORK.

The principal lines of work at the Iowa Station during the past year have been a continuation of those previously established and have included the selection and development of range-bred horses; feeding experiments with steers, sheep, and pigs; dairy investigations, especially bacteriological studies, fermentation tests, and comparative work with five different breeds of dairy cows; experiments with field crops, including cultural and breeding experiments with corn and various experiments with oats, barley, spring wheat, winter wheat, sorghum, rape, kohl-rabi, soy beans, and sugar beets; horticultural work in hybridizing fruits and testing cover crops for orchards; botanical investigations, especially studies of grasses of the State, fungus diseases of plants, and herbicides for weeds; bacteriological studies of fruits and waters; entomological investigations; chemical analysis of grasses, soils, dairy products, and adulterants of dairy products.

The station is cooperating with the Bureau of Chemistry of this Department in sugar-beet investigations and in testing varieties of wheat sent out by the Department. The botanist is studying the grasses of the State in cooperation with the State geological survey, which publishes the bulletins. He is also making a careful study of the time at which the plum is actually fertilized, it being claimed that there are several weeks during which this may occur. Last spring 250 head of range lambs were purchased and an experiment conducted to determine the practicability of finishing such lambs for the midsummer market. Those that were finished were used to determine results from feeding different grain rations as compared with the results when grass alone was used. Another interesting experiment is that with a bunch of steers which are being fed on condimental foods to test the real value of such material.

Twice within the year the Iowa college and station suffered severely from fire. In December, 1900, part of the main building burned and the divisions of botany and horticulture lost much of their apparatus and scientific collections. In October, 1901, the station barn was destroyed, with a loss of $12,000. The horse barn (Pl. I, fig. 1) recently completed by the college is 40 by 100 feet finished in hard pine, hard maple, and oak, and furnishes accommodations for 25 horses and ample storage room for carriages, harness, grain, and hay. The adjacent stock-judging pavilion is circular in form, 65 feet in diameter, has a seating capacity for 300 students, and a judging pit 50 feet in diameter. At the beginning of the fiscal year Prof. John Craig, horticulturist of college and station, resigned to go to Cornell University and was succeeded in May by Prof. H. C. Price, of the Ohio State University. Prof. John A. Craig, assistant director and animal husbandman, resigned to retire from college work and was succeeded by

Prof. W. J. Kennedy, of Illinois. Prior to his resignation Professor Craig published an important text-book on judging live stock. Several changes occurred also in the staff of assistants.

INCOME.

The income of the station during the past fiscal year was as follows:

United States appropriation	$15,000.00
Farm products	2,951.41
Miscellaneous, including fees	120.64
Total	18,072.05

A report of the receipts and expenditures for the United States fund has been rendered in accordance with the schedules prescribed by this Department, and has been approved.

PUBLICATIONS.

The publications of this station received during the past fiscal year were Bulletins 48–55, 57, and 58.

Bulletin 48, pp. 123, pls. 3, figs. 30, dgms. 2.—Economical Production of Beef—A Study of Pork Production—Fattening Range Lambs—Fattening Lambs in Comparison with Yearlings.—Feeding experiments bearing on the general question of producing beef economically under Iowa conditions and extending over a number of years are reported. A test was made with 14 steers to study the possibility of combining dairying and feeding for beef production and also to compare wide and narrow rations. The use of skim milk supplemented by grain was tested in the feeding of these animals as calves. The possibility of fattening range steers with profit on the feeding stuffs generally available locally was tested with 17 steers. The study of pork production here reported included a comparison of different breeds and crosses as regards cost of gain before and after weaning, a comparative trial of wide and narrow rations, a discussion of the value of different breeds for dressed pork and bacon, and chemical studies of the composition of pork. Two tests of the profitable fattening of range lambs and two tests of the comparative economy of feeding lambs and yearlings are reported.

Bulletin 49, pp. 9, figs. 7.—Miscellaneous Insects.—Notes are given on the Buffalo tree hopper, snowy tree cricket, and the box-elder plant bug, with suggestions as to remedies.

Bulletin 50, pp. 13.—Insecticide Methods.—A general account of numerous mechanical and chemical methods for combating injurious insects.

Bulletin 51, pp. 9.—Winter Wheat.—Results of tests of 19 varieties of wheat, several culture experiments, and the milling qualities of hard and soft winter wheat.

Bulletin 52, pp. 31.—Cream Testing—The Influence of Certain Conditions in Churning on the Amount of Water in Butter—A Study of Butter Increasers.—Testing cream by the Babcock method is discussed, suggestions are given for avoiding common sources of error, and investigations of the influence of the thickness of sweet and sour cream upon the amount adhering to the pipette in measuring and of the error resulting from measuring cream due to specific gravity are reported. Investigations made to determine the existence and effectiveness of some of the principles governing the proportion of water in butter, such as size and shape of granules, use of warm water in washing, and the extent of working, are reported. Two methods or recipes for increasing the yield of butter are quoted and the results of an investigation given.

Bulletin 53, pp. 10, pl. 1.—The Asparagus Rust in Iowa.—An account of the asparagus rust in Iowa, the cause of the disease, two parasites of *Puccinia asparagi*, and preventive measures. A brief bibliography of the subject is appended.

Bulletin 54, pp. 286, pls. 39, figs. 106, dgm. 1, chart 1.—Grasses.—Original observations and compiled notes are given on the general characteristics of grasses, their growth and minute structure, fertilization, and germination. The subject of purity and vitality of grass seed is considered. The more important cereals are described. The climatology of grasses is discussed, and notes are given on their uses in medicine. Sugar-producing grasses are enumerated, and notes are given on economic uses of grasses. The poisonous and injurious effects of certain grasses are mentioned. Various fungus diseases are described, and other topics connected with grasses are considered.

Bulletin 55, pp. 25, figs. 7.—Field Experiments.—A detailed account of variety and culture tests with corn, oats, barley, spring wheat, spelt, sorghum, rape, kohl-rabi, soy beans, and sugar beets.

Bulletin 57, pp. 14, pl. 1, figs. 2.—Experiments in Curing Cheese.—Experiments to test the feasibility of central curing rooms and to study the effects of climate upon the curing of cheese are reported. Cheese fresh from the press at the Iowa Station was shipped to cheese factories in Canada to be cured and also from the Canadian factories to the Iowa Station, the scorings being tabulated.

Bulletin 58, pp. 22.—Parturient Paralysis and the Schmidt Treatment.—A general account of the history, distribution, cause, pathological anatomy, symptoms, diagnosis, course, and treatment of this disease, and a summary of the results obtained in the use of the Schmidt treatment as reported by 33 veterinarians. A subject list of station bulletins is appended.

GENERAL OUTLOOK.

The main lines of investigation at the Iowa Station are those in animal industry and agronomy. The experiments with range-bred

colts have been quite successful, and show that fine horses can be developed if good stock be used. Several teams of these horses have been used for station work (Pl. I, fig. 2) and one team for driving. The experiments with dairy cows of five different breeds have been brought to a close and the results prepared for publication. Along the line of field crops the station is having good success in growing winter wheat, and is encouraging its production by farmers. Good results also have been obtained from cutting back oats and winter wheat to prevent lodging. Oats have been found a good nurse crop for clover, and farmers are using it as such upon the advice of the station. The farmers of the State are manifesting a deep interest in the work of the station and are quite generally applying its teachings in their practice. Each summer a farmers' picnic, which attracts farmers from all over the State, is held at the college and station, and this occasion is taken to post the farmers on the work of the college and station.

KANSAS.

Kansas Agricultural Experiment Station, *Manhattan.*

Department of Kansas State Agricultural College.

GOVERNING BOARD.

Board of Regents: J. S. McDowell (*Pres.*), *Smith Center;* F. D. Coburn (*V. Pres.*), *Kansas City;* E. T. Fairchild (*Treas.*), *Ellsworth;* William Hunter (*Loan Commissioner*), *Blue Rapids;* J. M. Satterthwaite, *Douglass;* S. J. Stewart, *Humboldt;* E. R. Nichols (*Sec.*), *Manhattan.*

STATION STAFF.

E. R. Nichols, M. A., *President of College and Chairman of Station Council.*

J. T. Willard, M. S., *Dir.; Chem.*
H. F. Roberts, M. S., *Bot.*
H. M. Cottrell, M. S., *Agr.*
E. A. Popenoe, M. A., *Ent.*
N. S. Mayo, M. S., D. V. M., *Vet.*
Lorena E. Clemons, B. S., *Sec.*
D. H. Otis, M. S., *Dairy Husb.*
F. C. Weber, B. S., *Asst. Chem.*
Albert Dickens, M. S., *Acting Hort.*
V. M. Shoesmith, B. S., *Asst. in Feeding and Field Work.*
A. T. Kinsley, M. S., *Asst. in Vet. Dept.*
J. B. Norton, *Asst. Ent.*
G. O. Greene, B. S., *Asst. Hort.*
Alice M. Melton, *Clerk.*

LINES OF WORK.

The work of the Kansas Station during the past year has been largely a continuation of work reported last year, and has included experiments in the production of "baby beef"—that is, preparation of animals for slaughter at about one year of age; calf raising by various modifications of their feed; feeding a scrub herd of dairy cows especially for a comparison of various kinds of leguminous forage; tests of two prominent condimental feeds as to their effect in the production of beef and milk; experiments in the improvement of blackleg vaccine; tests of the efficacy of "Detmer's virus" in protective inoculation against swine plague; studies of the tetanus bacillus as to

cultural features and the effects of disinfectants; digestion experiments; field experiments on a large scale with soy beans, especially with reference to soil inoculation; cowpeas for hay; thickening the stand of alfalfa, especially the influence of disking after each cutting; variety tests of a large number of grasses and forage plants on a small scale; propagation of some of the native grasses from seed; wheat breeding by cross fertilization; corn breeding with a view to increasing the nitrogen content; study of the relation between specific gravity and nitrogen content of corn; testing of sugar beets grown by farmers of the State; study of native plums and plum breeding by selection and cross fertilization; enlargement of the variety test of apples; study of certain prevalent diseases of orchard and nursery trees, especially the crown gall; the relation of apple rust to red cedar; defoliating fungi of the plum and cherry, and leaf curl of the peach; elaboration of the results of many years' observations upon the trees and shrubs available for lawn and park decoration; studies of plum insects, the apple worm, the cankerworm, and other orchard pests; study of aphids, especially those of the garden vegetables, and the wheat louse; and a review of the entire hemipterous fauna of the State.

In cooperation with the Bureau of Plant Industry of this Department, the station has inaugurated a series of experiments with grasses and forage plants in Harper County, a region of limited rainfall, and also in pasture and range grass improvement. Plans have also been made for cooperative experiments with the Bureau in the origination and testing of varieties of wheat and with the Bureau of Forestry in tree planting. Since the recent fire the chemical department of the station has been very poorly housed and equipped. The State, however, has given $70,000 for a new chemical and physical building which will not only provide quarters for the chemical department of the station, but will enable the director to bring together in one place certain work connected with his office which is now scattered through various college buildings. The agricultural department is renting various pieces of land in the vicinity of Manhattan, but it is expected that a portion of the Government reservation of 7,000 acres at Fort Hays, which has been turned over by act of Congress to the Agricultural College and State Normal School, will soon be available for experimental purposes. The last legislature appropriated $5,000 for the purchase of pure-bred farm stock, and the station has added to its equipment several pieces of valuable apparatus. At the beginning of the present fiscal year the board of regents created a chair of dairy husbandry in the college. During the year the veterinarian resigned to accept a similar position in the North Carolina college, and was succeeded by N. S. Mayo, of the Connecticut Agricultural College, Storrs, who was veterinarian at the Kansas college and station several years ago. The botanist resigned to become assistant agrostologist in this Department, and was succeeded by H. F. Roberts.

INCOME.

The income of the station during the past fiscal year was as follows:

United States' appropriations	$15,000.00
Farm products	5,345.21
Balance on hand July 1, 1900	610.69
Total	20,955.90

A report of the receipts and expenditures for the United States fund has been rendered in accordance with the schedules prescribed by this Department and has been approved.

PUBLICATIONS.

The publications of this station received during the past fiscal year were Bulletins 99–101 and the Annual Report for 1900.

Bulletin 99, pp. 56, fig. 1.—Press Bulletins Nos. 35–70.—This contains reprints of weekly press bulletins issued by the station from April 5, 1899, to June 26, 1900. The articles are based largely upon the results of experiments at the station.

Bulletin 100, pp. 59, pls. 5, map 1.—Soy Beans in Kansas in 1900.—Results of cooperative tests with soy beans reported by 292 farmers in 75 different counties of the State are presented in condensed form, together with the results of culture and variety tests at the station during 12 years.

Bulletin 101, pp. 27, pls. 26, figs. 2, dgms. 2.—Notes from the Plum Orchard.—Notes on the different varieties of European, Japanese, and native plums grown at the station, with illustrations of the more prominent varieties; nursery notes on the growth of several varieties; and a diagram showing the period of blooming and ripening of 24 varieties.

Annual Report, 1900, pp. 187, pls. 18, figs. 19, maps 2.—The report proper contains the organization list of the station, a financial statement for the fiscal year ended June 30, 1900, a general review of the work of the different departments, and a subject list of station publications issued since the organization of the station. Reprints of Bulletins 90–98 of the station are appended.

GENERAL OUTLOOK.

The prominence given to experiments in animal production, to the introduction of drought-resisting forage crops, and to breeding and other experiments with wheat and corn shows an appreciation on the part of the station officials of the relation the station investigations should bear to the principal productions of the State. Station work has been considerably disturbed by changes in the staff, losses by fire, and the large amount of college and farmers' institute work

required of the staff. Press bulletins have been published as heretofore, and the work of the station is becoming better known throughout the State.

KENTUCKY.

Kentucky Agricultural Experiment Station, *Lexington.*

Department of the Agricultural and Mechanical College of Kentucky.

GOVERNING BOARD.

Board of Control: Thos. Todd (*Chair.*), *Shelbyville;* R. S. Bullock (*Treas.*), *Lexington;* J. K. Patterson, *Lexington;* M. A. Scovell, (*Sec.*) *Lexington;* D. F. Frazee, *Lexington;* J. B. Marcum, *Jackson;* J. B. Kennedy, *Paris.*

STATION STAFF.

James K. Patterson, PH. D., *President of the College.*

M. A. Scovell, M. S., *Dir.; Chem.*
A. M. Peter, M. S., *Chem.*
H. E. Curtis, M. S., *Chem.*
H. Garman, *Ent. and Bot.*
C. W. Mathews, B. S., *Hort.*
J. N. Harper, B. S. *Agr.*
J. W. Nutter, *Asst. Dairy.*
J. O. La Bach, M. S., *Chem.*
W. H. Scherffius, B. S., *Asst. Chem.*
D. W. May, M. S., *Animal Husb.*
L. O. Beatty, M. S., *Asst. Chem.*
George Roberts, M. S., *Asst. Chem.*
S. D. Averitt, M. S., *Asst. Chem.*
T. L. Richmond, B. AGR., *Asst. to Ent. and Bot.*
Miss M. L. Didlake, M. S., *Asst. to Ent. and Bot.*
J. D. Turner, B. PED., *Sec. to Dir.*
R. M. Allen, B. A., *Clerk.*

LINES OF WORK.

The work of the Kentucky Station during the past year has been continued along the lines of field experiments with tobacco, hemp, potatoes, cereals, etc.; variety tests of grasses and other forage plants; horticultural investigations; studies of plant diseases; entomological and botanical investigations; dairying, especially studies of the variation of butter fat in the milk of cows; meteorological observations; studies of soils, root tubercles, and methods of analysis; and inspection of fertilizers, foods, and nursery stock. Interesting results regarding the root tubercles of soy beans have been obtained; also data that will serve as a guide in determining the time to sow wheat in order to avoid injury from the Hessian fly. Material for publication has been prepared from studies of methods of fumigating stored grains, of mosquitoes occurring in Kentucky, and of hemp insects. The station is cooperating with the Bureau of Chemistry of this Department in experiments on the influence of environment on the sugar content of muskmelons, sugar-beet investigations, and studies of the gluten content of wheat.

The new barn for conducting experiments in curing tobacco has been completed and another farm purchased, which brings the area of the station farm up to 200 acres. A new form of fumigating appa-

ratus, suitable for use in the vivarium with tobacco extracts on low-growing plants, has been devised. During the year the station staff has been increased by the addition of several assistants. At a recent meeting of the board of trustees a division of animal husbandry was created and the erection of a dairy barn authorized. D. W. May, of this Office, has been elected animal husbandman.

INCOME.

The income of the station during the past fiscal year was as follows:

United States appropriation	$15,000.00
State appropriation, including balance from previous year	3,123.87
Fees, including balance from previous year	33,054.29
Farm products, including balance from previous year	4,372.31
Miscellaneous, including balance from previous year	110.76
Total	55,661.23

A report of the receipts and expenditures for the United States fund has been rendered in accordance with the schedules prescribed by this Department, and has been approved.

PUBLICATIONS.

The publications of this station received during the past fiscal year were Bulletins 86–92 and the Annual Report for 1898.

Bulletin 86, pp. 51.—Inspection and Analyses of Foods.—Analyses of 727 samples of food products made in accordance with the Kentucky pure-food law, with suggested definitions of food materials and articles used in their preparation.

Bulletin 87, pp. 70, pls. 14.—Kentucky Forage Plants—the Grasses.—Analyses of Some Kentucky Grasses.—Notes on 141 species of native and introduced Kentucky grasses, and results of analyses with reference to food constituents of the air-dry and water-free material of 79 samples of grasses cut at different stages of growth and comprising 31 species.

Bulletin 88, pp. 49.—Commercial Fertilizers.—General results of fertilizer inspection, including tabulated analyses and valuations of 361 samples.

Bulletin 89, pp. 24, pls. 4.—Wheat.—Results of fertilizer experiments and of tests of some 30 varieties of wheat, with descriptions and illustrations.

Bulletin 90, pp. 32.—Commercial Fertilizers.—Analyses and valuations of 175 samples of fertilizers inspected during the last half of 1900.

Bulletin 91, pp. 68, pls. 5, figs. 10.—Enemies of Cucumbers and Related Plants.—Experiments with Potato Scab.—The Food of the Toad.—Descriptive, life history, and remedial notes are given on the striped cucumber beetle, spotted cucumber beetle, northern squash

beetle, melon aphis, and a number of other insects affecting cucumbers. A nematode disease of cucumbers is described, and descriptive notes and directions for prevention are given of a number of fungus diseases affecting cucumbers. Experiments in the treatment of seed potatoes with corrosive sublimate and formalin for the prevention of potato scab are reported. Observations on the feeding habits of the toads of Kentucky are given, and the various insects and food materials which were found are classified in detail.

Bulletin 92, pp. 29, pls. 7.—Grapes.—Detailed popular directions for the planting, pruning, training, cultivating, and fertilizing of grapes, with notes on insect ememies and diseases. Descriptive notes are given on 87 varieties of grapes grown at the station.

Annual Report, 1898, pp. 245, pls. 14, figs. 3, maps 3.—This contains a financial statement for the fiscal year ended June 30, 1900; a general review of station work by the director; departmental reports, including analyses of 140 samples of butter, 8 of sorghum, 105 of sugar beets, 19 of mineral waters, and 17 of miscellaneous substances, and a summary of meteorological observations for 1898; and reprints of Bulletins 72–79 of the station.

GENERAL OUTLOOK.

The Kentucky Station is in a prosperous condition. The fees arising from the inspection of fertilizers during the past year amount to over $25,000, and receipts from other sources bring the total revenue of the station up to more than $55,000. This has enabled it to purchase land, erect new buildings, and make other improvements. Furthermore, a division of animal industry has been added, and plans have been made for extending the work in horticulture and for the erection of several new buildings. Heretofore the station has confined its investigations rather closely to lines related to the production and handling of tobacco, hemp, and other staple crops of the State, together with some investigations in dairying, but it is now extending its operations to include other important industries of the State.

LOUISIANA.

No. 1. Sugar Experiment Station, *Audubon Park, New Orleans.*
No. 2. State Experiment Station, *Baton Rouge.*
No. 3. North Louisiana Experiment Station, *Calhoun.*

Department of Louisiana State University and Agricultural and Mechanical College.

GOVERNING BOARD.

State Board of Agriculture and Immigration: Gov. W. W. Heard, *Baton Rouge;* Wm. Garig (*V. Pres.*), *Baton Rouge;* J. G. Lee (*Commissioner*), *Baton Rouge;* Thos. D. Boyd (*Pres. State University*), *Baton Rouge;* Wm. C. Stubbs (*Dir. State Expt. Sta.*), *Baton Rouge;* Jno. Dymond, *Belair;* Emil Rost, *St. Rose;* A. V. Eastman, *Lake Charles;* E. T. Sellers, *Walnutlane;* Chas. Schuler, *Keatchie;* H. P. McClendon, *Amite.*

STATION STAFF.

T. D. Boyd, *President of the College (Baton Rouge).*

Sugar Experiment Station, *Audubon Park, New Orleans.*

Wm. C. Stubbs, M. A., Ph. D., *Dir.*
R. E. Blouin, M. S., *Asst. Dir. Chem.*
P. L. Hutchinson, B. S., *Chem.*
Robert Glenk, B. S., *Chem.*
S. Baum, B. S., *Asst. Chem.*
G. W. Agee, B. S., *Asst. Chem.*
George Chiquelin, *Sugar Maker.*
W. D. Clayton, M. S., *Farm Manager.*
G. D. Harris, M. S., M. A., *Geol.*
Jas. K. McHugh, *Sec. and Sten.*
T. D. Boyd, jr., B. S., *Asst. Chem.*

State Experiment Station, *Baton Rouge.*

Wm. C. Stubbs, M. A., Ph. D., *Dir.*
W. R. Dodson, B. A., S. B., *Asst. Dir.*
H. A. Morgan, B. S. A., *Ent.*
W. H. Dalrymple, M. R. C. V. S., *Vet.*
F. H. Burnette, *Hort.*
B. H. Atkinson, *Farm Manager.*

North Louisiana Experiment Station, *Calhoun.*

Wm. C. Stubbs, M. A., Ph. D., *Dir.*
D. N. Barrow, B. S., *Asst. Dir.*
Maurice Bird, B. S., *Chem.*
J. F. Harp, B. S., *Chem.*
W. R. Goyne, *Farm Manager.*
Eugene J. Watson, *Hort.*
A. T. Anders, *Dairyman and Poultryman.*

LINES OF WORK.

The work of the three Louisiana stations during the past year has been along the same general lines as heretofore, some of the principal subjects of investigation being as follows:

Sugar Station.—Sugar cane has received most attention at this station. Experiments to determine the manurial requirements of this plant, which have been in progress for eleven years, have been continued; also experiments in methods of cultivation, selection, and testing new varieties. In the sugar house have been conducted extensive experiments in clarifying, filtering, evaporating, and cooking, and a series of systematic investigations with artificial mixtures of sugar and other substances to determine the restraining influence of these added substances on the crystallization of sugar. The station is also experimenting with alfalfa, clover, grasses, and other forage crops, varieties of corn, cotton, hybrid orange trees, and tea plants. The inspection of fertilizers and Paris green has been continued as heretofore.

State Station.—Work here has included fertilizer experiments with corn and cotton, rotation experiments to discover a method of restoring the soils of the bluff regions, and investigations with forage crops. Tobacco experiments, as reported last year, have been continued. The veterinarian has demonstrated the usefulness of inoculation for Texas fever in Louisiana and is now studying diseases of sheep. The botanist and bacteriologist has been studying diseases of plants and a process of sterilizing sirups and molasses. There are also feeding

experiments with cattle; variety and fertilizer experiments with pears and other fruits; and entomological investigations, especially on the cane borer, for which a practical remedy has been developed. The new laboratory building has been completed and a large college dormitory building is in process of construction.

NORTH LOUISIANA STATION.—Fertilizer experiments with corn, cotton, and other crops, experiments in the utilization of corn fodder, rotation experiments, tobacco experiments, dairy investigations, study of a nodular disease in the intestines of sheep, and experiments with forage crops and orchard fruits have been the principal lines of investigation at this station. Considerable attention is given to the introduction of improved breeds of live stock and to methods for saving various kinds of fodder.

The Louisiana stations are cooperating with the Division of Entomology of this Department in the investigation of outbreaks of grasshoppers and with the Bureau of Plant Industry of this Department in growing hybrid orange trees. The geological survey of the State has been continued and valuable data have been secured regarding the depth, rate of flow, etc., of artesian wells. The soil survey also has been continued, together with physical and chemical analyses of soils. Farmers' institutes, under the direction of the commissioner of agriculture, assisted by members of the station staff, were held in nearly every parish of the State.

INCOME.

The income of the stations during the past fiscal year was as follows:

United States appropriation	$15,000.00
State appropriation	18,000.00
Fees	2,350.03
Farm products	1,481.73
Miscellaneous, including balance from previous year	9,435.75
Total	46,267.51

A report of the receipts and expenditures for the United States fund has been rendered in accordance with the schedules prescribed by this Department, and has been approved.

PUBLICATIONS.

The publications of this station received during the past fiscal year were Bulletins 60–63 and the Annual Report for 1900.

Bulletin 60, pp. 30.—Charbon.—A discussion of legislation against this disease and detailed notes on a trip of inspection made through the State for the purpose of determining the extent of anthrax, the conditions under which infection takes place, and the sanitary measures adopted.

Bulletin 61, pp. 67, pls. 13, figs. 10.—Rice.—A discussion of the lands best adapted to this crop; methods of soil preparation, planting, flooding, and harvesting the crop; varieties cultivated in Louisiana; composition of rice and its straw, with data regarding the production of rice in Louisiana; irrigation methods employed, money invested in irrigation plants, and the acreage under irrigation; and an account of the more important weeds occurring in the rice fields of Louisiana, their methods of distribution, and the various means of destruction.

Bulletin 62, pp. 37.—Results for 1899 at North Louisiana Experiment Station.—Brief notes on the live stock kept at the station; results of various culture, variety, and rotation experiments with cotton, wheat, corn, tobacco, and other crops; and a monthly summary of meteorological observations for eight years.

Bulletin 63, pp. 118.—Analyses of Commercial Fertilizers and Paris Green.—A discussion of the source and valuation of fertilizers, analyses of 1,817 samples of fertilizing materials, statistics of the fertilizer industry in the State, text of the State law regulating the sale and purity of Paris green, with analyses of a large number of samples.

Annual Report, 1900, pp. 22.—An account of the work of the Sugar Station, State Station, and the North Louisiana Station; the organization lists of the stations; and a financial statement for the fiscal year ended June 30, 1900.

GENERAL OUTLOOK.

The fertilizer requirements of the leading field crops of Louisiana and the best method of restoring fertility to worn-out soils are subjects that have occupied prominent places in the investigations of the Louisiana stations ever since their organization. The fertilizer experiments conducted simultaneously at the three stations during the past decade indicate that nitrogen is the element most needed by the soils of Louisiana for the production of every crop grown and that phosphoric acid is next in importance. The best method of restoring fertility has been found to be a system of rotation of crops, in which legumes figure prominently. Closely connected with these investigations is a systematic soil survey of the State, in which the officials of these stations have been engaged for a number of years. A geological survey of the State is also going forward under station auspices, special attention being given to sources of artesian water supply. The principal crops receiving attention are sugar cane, cotton, and tobacco, and with each of these a great deal of valuable work has been done. At the same time other crops are receiving attention and considerable effort is being directed to the introduction of the live-stock industry. The work is vigorously and intelligently prosecuted and is increasing in importance from year to year.

MAINE.

Maine Agricultural Experiment Station, *Orono.*

Department of University of Maine.

GOVERNING BOARD.

BOARD OF TRUSTEES OF THE UNIVERSITY.

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STATION STAFF.

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Gilman A. Drew, B. S., *Zool.*
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M. B. Cummings, B. S., *Asst. Hort.*
Miss Annie M. Snow, *Sten.*

LINES OF WORK.

The work of the Maine Station during the past year followed substantially the same lines as in the previous year, including investigations on the food and nutrition of man and domestic animals, poultry experiments, breeding experiments with sheep, digestion experiments with sheep and steers, box and field experiments with fertilizers, horticultural investigations, work in veterinary science and practice, and botanical and entomological observations. A study of mollusks (scallops) was begun. The experiments in sheep breeding consist in the crossing of Dorsets to secure earliness of lambing combined with other qualities. The experiments in propagating and improving blueberries have been continued with promising results. The station has made studies of the nutritive value of concentrated foods, prepared flours and fruits, and, in cooperation with this Office, is continuing studies on the nutritive value and digestibility of cereals and bread with special attention to methods of determining digestibility. It is proposed that to this work be added studies of the dietaries of lumbermen, for which studies the opportunities are peculiarly favorable. The station is also cooperating with the Bureau of Plant Industry of this Department in the breeding of wheat and potatoes. Investigations on the effect of climate on the varieties of wheat and potatoes have been carried on as heretofore.

The station continues to cooperate with farmers in Aroostook and Kennebec counties in experiments in apple growing, which consist

of tests of varieties, mainly Russian, and tests of fertilizers, cultivation, and spraying, which have been in progress at this station for several years. To these have been added cooperative experiments in manuring and spraying potatoes in Aroostook County, very favorable terms having been arranged with farmers in that county.

INCOME.

The income of the station during the past fiscal year was as follows:

United States appropriation	$15,000.00
Fees	4,526.10
Farm products	2,714.36
Balance from previous year	103.62
Total	22,344.08

A report of the receipts and expenditures for the United States fund has been rendered in accordance with the schedules prescribed by this Department, and has been approved.

PUBLICATIONS.

The publications of this station received during the past fiscal year were Bulletins 66–72.

Bulletin 66, pp. 16.—Fertilizer Inspection.—Tabulated analyses of 157 samples of fertilizers inspected by the station.

Bulletin 67, pp. 38.—Digestion Experiments with Sheep.—Note on Heats of Combustion.—Experiments with sheep to determine the digestibility of a number of feeding stuffs are reported in detail in tabular form. An investigation to compare determined and calculated heats of combustion is also reported.

Bulletin 68, pp. 22.—Experiments with Insecticides upon Potatoes.—This bulletin contains a detailed report of a series of experiments with several commercial insecticides in comparison with Paris green as a remedy for the potato beetle.

Bulletin 69, pp. 44.—Finances, Meteorology, Index.—A monthly summary of meteorological observations at Orono during 1900, a financial statement for the fiscal year ended June 30, 1900, an index to the annual reports of the station for 1897 to 1900, and brief notes by the director on the work of the station.

Bulletin 70, pp. 16.—Oats as Grain and Fodder.—A discussion of the importance and value of oats as grain and fodder, analyses of oats grown in different parts of the State, and coefficients of digestibility of oat products obtained in experiments at the station.

Bulletin 71, pp. 16.—Feeding Stuff Inspection.—Tabulated analyses of a large number of samples of feeding stuffs inspected in December, 1900, with a brief discussion of the results.

Bulletin 72, pp. 8.—Fertilizer Inspection.—Analyses of 136 samples of commercial fertilizers, with a summary of the chief provisions of the State fertilizer law.

GENERAL OUTLOOK.

The work of the Maine Station has been developed along both practical and scientific lines, and while much of it is of purely local value, much also, especially the feeding experiments and nutrition investigations, is of general interest. The cooperative work with farmers, investigations with blueberries, feeding, breeding, and fertilizer experiments, and the investigations with poultry, potatoes, and fruit are all of such vital interest locally that they are bringing the station into closer relations with the farmers of the State. The work with poultry is well planned and vigorously conducted, but the breeding problems have developed some unexpected complexities, and it seems necessary to study the causes of degeneration as well as of improvement of breeds.

Farmers' institutes were held by the State board of agriculture at about 90 different places during the year, and members of the station staff assisted at 50 of these. The inspection service performed by the station includes the testing of fertilizers, seeds, feeding stuffs, and creamery glassware, and is fully supported by State funds. The station has begun the publication of press bulletins which are quite generally used by the newspapers of the State, and the advisability of introducing correspondence courses, through the college, is being considered.

MARYLAND.

Maryland Agricultural Experiment Station, *College Park.*

GOVERNING BOARD.

Board of Trustees—Agricultural Committee: Gov. John W. Smith, *Annapolis;* Charles H. Stanley, *Laurel;* Charles W. Slagle, *Baltimore;* David Seibert, *Clearspring;* Murray Vandiver, *Havre de Grace;* W. Scott Whiteford, *Whiteford;* Allen Dodge, *Washington, D. C.*

STATION STAFF.

R. W. Silvester, *President of the College.*

Harry J. Patterson, B. S., *Dir.; Chem.*
James S. Robinson, *Hort.*
A. L. Quaintance, M. S., *Ent.*
Samuel S. Buckley, D. V. S., *Vet.*
W. T. L. Taliaferro, M. A., *Agr.*
J. B. S. Norton, M. S., *Bot. and Veg. Path.*
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Ralph I. Smith, B. S., *Asst. Ent.*
Thos. M. Price, M. S., *Asst. Chem.*
E. P. Sandsten, M. S., *Assoc. Hort. and State Hort. Inspector.*
C. F. Doane, M. S., *Agr., Dairy Husb. and Bact.*
F. H. Blodgett, B. S., *Asst. Plant Path. and Bot.*
Jos. R. Owens, M. D., *Treas.*
B. H. Gibbs, *Clerk.*

LINES OF WORK.

The work of the Maryland Station during the past year has included chemical investigations, especially fertilizer tests, curing experiments with tobacco, feeding experiments, studies of milk preservatives, and of the digestibility of raw, pasteurized, and sterilized milk; dairy work, including bacteriological studies; field experiments with fertilizers and staple crops to test varieties, methods of culture, value of early and late planting, etc.; soil inoculation experiments; horticultural investigations, including greenhouse experiments, plant improvement by selection and breeding, and variety tests of fruits; studies in plant pathology, especially peach yellows, diseases of pears and apples, asparagus rust, cantaloupe blight, and diseases of carnations; entomological investigations. The station is cooperating with farmers in the State in a large number of experiments and with this Department as follows: With the Bureau of Plant Industry, in cereal investigations, a variety test of sweet potatoes, a study of the influence of origin of red clover seed on yield of crop, and experiments to determine the best crops for use in securing a continuous soiling series for dairy and farm stock; and with the Bureau of Chemistry, on the gluten content of wheat and on the influence of environment on the sugar content of muskmelons.

The divisions of plant pathology and entomology of this station are mostly occupied with inspection work connected with the State horticultural inspection law, but conduct careful investigations in order to determine the best methods of procedure in carrying out the provisions of the law. The veterinary division is attached to the station in the capacity of a department for consultation rather than for research work, but at present the veterinarian is also studying mammitis or garget, parturient paresis or milk fever, and acute hemorrhagic encephalitis of horses. This last disease has been positively identified within the last few months and is not, as commonly supposed, cerebro-spinal meningitis or staggers. In the chemical division the effect of preservatives on the digestibility of milk for calves has constituted quite a lengthy investigation and is still in progress. The station has recently inaugurated a system of apprenticeships in dairying and horticulture, furnishing young men board, room, and instruction along practical lines in consideration of their working several hours each day for the station. Station officers assist in farmers' institute work which is supported by a State appropriation of $4,000 in charge of the college.

The personnel of the station staff has suffered numerous changes during the year. The entomologist and plant pathologist and their assistants and the assistant soil physicist resigned to accept more desirable positions. Four of the vacancies have been filled, but that of

assistant soil physicist, owing to a decision of the station authorities to discontinue its regular soil work, will not be filled.

INCOME.

The income of the station during the past fiscal year was as follows:

United States appropriation	$15,000.00
Farm products	4,440.08
Balance from previous year	98.72
Total	19,538.80

A report of the receipts and expenditures for the United States fund has been rendered in accordance with the schedules prescribed by this Department, and has been approved.

PUBLICATIONS.

The publications of this station received during the past fiscal year were Bulletins 65–74 and the Annual Report for 1900.

Bulletin 65, pp. 37, figs. 19.—Insecticides, Fungicides, and Spraying Apparatus.—A popular account of the preparation and use of the more important insecticides and fungicides, descriptive notes on spraying apparatus, and a spray calendar.

Bulletin 66, pp. 44, maps 2.—The Occurrence and Composition of Lime in Maryland, together with the Results of Experiments in Testing its Use in Agriculture.—This bulletin includes a general discussion of the relation of lime to agriculture, the action of lime on soils, the time and methods of applying lime, methods of determining the need of lime, descriptions of different kinds of lime used in agriculture, the occurrence and composition of lime in Maryland, including analyses of 121 samples of limestone, 2 of oyster shells, 27 of burned lime, 5 of gas lime, and 90 of marl; and detailed accounts of several series of experiments with lime made at the station since 1889.

Bulletin 67, pp. 24, pls. 8.—The Culture and Handling of Tobacco.—Among the topics treated are the methods of selecting, grading, packing, and topping Maryland tobacco; varieties for Maryland and methods of improving them; uses of green manure for supplying humus and improving the yield and quality of tobacco, fertilizers for tobacco, root system of the tobacco plant, methods of tillage, and the relation of original and natural vegetation to the adaptability of soils for tobacco culture.

Bulletin 68, pp. 29.—Fertilizer Experiments with Different Sources of Phosphoric Acid.—An account of experiments begun in the spring of 1895 on tenth-acre plats to test the comparative availability of double superphosphate (soluble and reverted), dissolved boneblack, dissolved South Carolina rock, iron and alumina phosphate (reverted),

boneblack, raw bone meal, slag phosphate, ground South Carolina rock, and Florida soft phosphate.

Bulletin 69, pp. 30, pls. 7.—The Influence of Feed and Care on the Individuality of Cows.—An attempt to increase the productive capacity of the individual cows of a grade herd by systematic feeding and good care extending over a number of years is reported, the records being tabulated and the results discussed in regard to the effect of feeding and care upon the development of the cows.

Bulletin 70, pp. 52.—The Chemical Composition of Maryland Soils.—Analyses of 60 samples of soil representing typical soil formations of the State made in the laboratory of the Division of Soils of this Department; a discussion of the importance, object, and scope of soil work and the purpose and methods of chemical examination of soils; descriptions of the samples analyzed, and a discussion of their classification with reference to geological formations, typical crops, and chemical and mechanical composition.

Bulletin 71, pp. 13, pls. 2.—Notes on Spraying Peaches and Plums in 1900.—Notes on the occurrence of fruit rot (*Monilia fructigena*) upon peaches and plums and the results of experiments in spraying with Bordeaux mixture for the prevention of this disease.

Bulletin 72, pp. 25, pl. 1, figs. 4.—Peach Growing in Maryland.—A discussion of the historical development of the peach industry in Maryland, its present status, the culture of the orchard, and the marketing of the fruit.

Bulletin 73, pp. 14, figs. 2.—Suggestions About Combating the San José Scale.—An account of experiments conducted for the purpose of determining the effect of different percentages of kerosene on peach trees and on the San José scale, and a discussion of the value of crude petroleum, whale-oil soap, and fumigation with hydrocyanic-acid gas as remedies for the San José scale.

Bulletin 74, pp. 16, pls. 3, figs. 4.—Notes on Celery Blight.—Celery blight is described and experiments made during three years in shading and spraying plants with ammoniacal copper carbonate and Bordeaux mixture for the prevention of this disease are reported.

Annual Report, 1900, pp. 171, pls. 20, figs. 17, maps 2.—A brief review of station work, a meteorological summary for 1899, a financial statement for the fiscal year ended June 30, 1900, and reprints of Bulletins 63–67 of the station.

GENERAL OUTLOOK.

The Maryland Station has done and is doing much useful work to promote the diversification of agriculture in the State and to develop more intensive and modern methods of farming. The work of the station in surveying and mapping soils preceded and led up to the soil investigations in this Department. Farmers have been shown the

desirability of a discriminating use of fertilizers and the advantages of more careful cultivation of their crops. The establishment of dairy farming and dairying on a modern scientific basis has been helped by the feeding experiments and other work conducted by the station. The horticultural interests of the State have been promoted by pointing out improved methods of handling and marketing fruits and vegetables, by illustrating the opportunities offered by different markets and the varieties adapted to the same, and by the introduction of scientific methods for the repression of insect pests and plant diseases. All of this work has been done with funds appropriated by the National Government, with the exception of the small sums arising from the sale of farm products.

MASSACHUSETTS.

Hatch Experiment Station of the Massachusetts Agricultural College, *Amherst.*

Department of the Massachusetts Agricultural College.

GOVERNING BOARD.

James Draper (*Chair.*), *Worcester;* James W. Stockwell, *Boston;* William Wheeler, *Concord;* Elijah W. Wood, *West Newton;* William R. Sessions, *Springfield;* William H. Bowker, *Boston;* Henry H. Goodell, *Amherst.*

STATION STAFF.

H. H. Goodell, LL. D., *President of the College and Director.*

William P. Brooks, PH. D., *Agr.*
George E. Stone, PH. D., *Bot. and Myc.*
Charles A. Goessmann, PH. D., LL. D., *Hon. Dir.; Chem.* (Fertilizers).
Joseph B. Lindsey, PH. D., *Chem.* (Foods and Feeding).
Charles H. Fernald, PH. D., *Ent.*
Samuel T. Maynard, B. S. *Hort.*
J. E. Ostrander, C. E., *Met.*
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Ralph E. Smith, B. S., *Asst. Bot. and Myc.*
Henri D. Haskins, B. S., *Asst. Chem.* (Fertilizers).
James E. Halligan, *Asst. Chem.* (Fertilizers).
Edward B. Holland, M. S., *First Chem.* (Foods and Feeding).
Philip H. Smith, B. S., *Asst. Chem.* (Foods and Feeding).
Henry T. Fernald, PH. D., *Assoc. Ent.*
George A. Drew, B. S., *Asst. Hort.*
Henry L. Bodfish, *Observer.*
George F. Mills, *Treas.*

LINES OF WORK.

The work of the Massachusetts Hatch Station during the past year, as formerly, has included chemical investigations, analysis and inspection of fertilizers and concentrated commercial feeding stuffs, field experiments, horticultural work, study of diseases of plants and animals, digestion and feeding experiments, entomological investigations, study of dairy problems, and meteorological observations. In the division of foods and feeding, investigations are being continued on

the effect of foods, especially oils, on butter. Feeding experiments have been continued, in which nitrogenous crops, such as soy beans and cowpeas, are used instead of concentrated feeding stuffs. The field experiments include rotation experiments with different fertilizers. There are also experiments with different crops and fertilizers in cylinders and in pots. In the grass garden numerous varieties are grown, and some varieties of timothy sent from the West Virginia Station give promise of special usefulness. The agriculturist has recently published a three-volume manual of instruction on agriculture. The horticulturist is conducting numerous experiments with different kinds of cover crops, varieties of orchard and small fruits, vegetables, methods of culture, and fertilizers. The entomologist has conducted investigations on the elm-tree beetle, the San José scale, and other insects of the State. He has nearly completed an extensive catalogue of the Coccidæ of the world and is now considering the problem of fumigating large trees for eradicating San José scale. Several advanced students are making special investigations under the direction of the entomologist on such subjects as thrips, flies, and bumblebees. Asparagus rust and a disease of asters are among the important plant diseases receiving attention.

The inspection duties of the station are large and have recently been increased by the enactment of a law requiring dairy glassware to be tested by the station. The fertilizer inspection brings a small revenue to the station; the others merely pay expenses. The agriculturist finds increasing evidence that on Massachusetts soils the effect of fertilizers varies greatly with the crop under investigation. He is keeping a very careful record of the experiments conducted under his supervision and has introduced an improved system of recording notes. Feeding experiments with dairy cows show temporary effects from the use of oils, but after a time the amount of fat in the milk returns to the normal. The experiments in feeding nitrogenous crops instead of concentrated feeding stuffs indicate that it does not pay to grow such crops in Massachusetts for the protein in their seeds or hay. The veterinary building recently completed by the college is a substantial and conveniently arranged structure. The college library has one of the most important collections of agricultural literature in this country, and is outgrowing its present quarters.

INCOME.

The income of the station during the past fiscal year was as follows:

United States appropriation	$15,000.00
State appropriation	11,200.00
Fees	3,490.25
Farm products	2,091.08
Miscellaneous	2,050.50
Total	33,831.83

A report of the receipts and expenditures for the United States fund has been rendered in accordance with the schedules prescribed by this Department, and has been approved.

PUBLICATIONS.

The publications of this station received during the past fiscal year were Bulletins 68–74, Meteorological Bulletins 138–148, and the Annual Report for 1900.

Bulletin 68, pp. 28.—Analyses of Commercial Fertilizers.—Tabulated analyses of 275 samples of fertilizing materials.

Bulletin 69, pp. 40, pls. 2, figs. 5, dgms. 7.—The Rotting of Greenhouse Lettuce.—Several diseases affecting greenhouse lettuce are described and a brief bibliography is given of the subject. An extended account is given of experiments conducted for the control, by the sterilization of the soil, of the "drop" caused by the fungus *Sclerotinia libertiana* and a disease due to a species of Rhizoctonia.

Bulletin 70, pp. 26.—Analyses of Fertilizers.—Tabulated analyses of 231 samples of fertilizing materials.

Bulletin 71, pp. 40.—Concentrated Feed Stuffs.—Condimental Stock and Poultry Foods.—Analyses of a large number of samples of feeding stuffs and of condimental stock and poultry foods and condition powders, with a discussion of the results.

Bulletin 72, pp. 16, pls. 4.—Summer Forage Crops.—A description of the different forage crops which have been grown at the station for soiling purposes, with a discussion of the relative advantages of pasturage and soiling, fertilizers for forage crops, and feeding forage crops for milk production, and tables showing the composition and digestibility of grasses, cereals, legumes, and various fodder mixtures.

Bulletin 73, pp. 15.—Orchard Experiments.—Notes on the methods followed at the station in the culture, fertilizing, and spraying of apples, peaches, pears, grapes, blackberries, raspberries, currants, and strawberries, with the results of variety tests, and a spray calendar.

Bulletin 74, pp. 16.—Analyses of Fertilizers and of Paris Green and Other Insecticides.—Analyses of 64 samples of fertilizing materials and 19 of Paris green and other insecticides, with directions for sampling fertilizers, notes on valuation, and State laws relating to commercial fertilizers.

Meteorological Bulletins 138–148, pp. 4 each.—Notes on the weather and monthly summaries of meteorological observations for the year ended April 30, 1901, with an annual summary for 1900 in Meteorological Bulletin 144.

Annual Report, 1900, pp. 132.—This contains a brief summary of station work during the year, a financial statement for the fiscal year ended June 30, 1900, and reports of the heads of departments reviewing in detail the different lines of station work during the year, and

giving in addition a summarized account of experiments relative to the effect of food and food constituents on the quality of milk and butter conducted at the station during a period of six years; analyses and coefficients of digestibility obtained in experiments with sheep of barnyard millet, with a discussion of its feeding value; a discussion of dried distillery grains, with analyses and results of digestion experiments with sheep; coefficients of digestibility of a number of feeding stuffs obtained in experiments with sheep; analyses of purslane and "Parson's six-dollar feed;" results of fertilizer inspection during the year; analyses of wood ashes, sludge, and phosphatic slag, with notes on their value for manurial purposes; brief notes on several plant diseases and on the Russian thistle; an account of investigations carried on for some time on the influence of various chemical solutions upon the germination of seed; brief notes on a number of insects troublesome during the year; results of comparisons of several nitrogenous fertilizers; an account of experiments with leguminous crops as nitrogen gatherers; results of comparisons of muriate and sulphate of potash and of different phosphates; an account of soil tests with grass and onions; results of experiments with corn in which a special fertilizer was compared with a fertilizer rich in potash, and manure alone was compared with manure and potash; notes on the relative value of soy beans and cowpeas for green manuring; results of experiments in manuring grass lands, and an account of feeding experiments with poultry.

GENERAL OUTLOOK.

In Massachusetts intensive agricultural methods prevail and problems of food supply for plants and animals are important. To these, and closely related problems, such as diseases and insects injurious to plants and animals, the station has given much attention. There are also important investigations in dairying, fruit growing, poultry raising, and market gardening. The inspection services performed by the station and the analysis of miscellaneous articles for farmers are important, but have grown to such proportions as to become burdensome. The utilization of the work of advanced students in connection with the entomological investigations of this station is a good example of the advantage of the combination of an experiment station and agricultural college in a single institution, provided it is well equipped for higher work in special lines.

MICHIGAN.

Experiment Station of Michigan Agricultural College, *Agricultural College.*[a]

Department of Michigan Agricultural College.

GOVERNING BOARD.

State Board of Agriculture: T. F. Marston (*Pres.*), *Bay City;* Franklin Wells, *Constantine;* Chas. J. Monroe, *South Haven;* Gov. Aaron T. Bliss, *Lansing;* Jonathan L. Snyder (*Pres. of College*), *Agricultural College;* E. P. Allen, *Ypsilanti;* H. F. Marsh, *Allegan;* L. W. Watkins, *Manchester.*

STATION STAFF.

Jonathan L. Snyder, M. A., Ph. D., *President of the College.*

Clinton D. Smith, M. S., *Dir.*
J. D. Towar, B. S., *Agr.*
Robert C. Kedzie, LL. D., *Chem.*
L. R. Taft, M. S., *Hort.*
M. L. Dean, *Asst. Hort.*
F. W. Robison, B. S., *Asst. Chem.*
George A. Waterman, D. V. M., *Consulting Vet.*
R. H. Pettit, B. S. A., *Ent.*
Chas. F. Wheeler, B. S., *Consulting Bot.*
Mrs. L. E. Landon, *Libr.*
C. E. Marshall, Ph. B., *Bact.*
T. A. Farrand, *In Charge of Substa.* (*South Haven*).
Leo. M. Geismar, *In Charge of Substa.* (*Chatham*).

Louzena D. Kellum, *Clerk and Sten.*

LINES OF WORK.

During the past year much of the work at the Michigan Station has been along lines taken up in previous years. These have included variety, cultural, fertilizer, and seasonal experiments with sugar beets; experiments with sand lucern, cowpeas, and other legumes for hay; rotation experiments begun in 1895; experiments at the station and on farms in different parts of the State with corn, oats, beets, and other crops grown on muck with different commercial fertilizers, stable manure, lime, ashes, etc.; variety tests of strawberries, fruits, and potatoes; spraying experiments with apples and other orchard fruits; fertilizer experiments with greenhouse crops; fertilizer inspection; seed testing; analysis of sugar beets and flours; study of new methods of judging wheats and flours; study of problems related to pure milk supply; entomological investigations, especially with scale insects and with wax to protect trees against peach borer; and forestry experiments.

Among new lines of work taken up may be mentioned experiments with tobacco, which is now becoming an important crop in the State; experiments in the utilization of sugar-beet pulp as a feeding stuff; feeding experiments with Western lambs *v.* Michigan lambs, studying incidentally liability to internal parasites; the growing of corn with cowpeas, soy beans, and other legumes for silage mixtures; experiments with varieties of wheats, hops, soy beans and miscellaneous

[a] Freight and express address, *Lansing.*

forage crops from seeds furnished by the Bureau of Plant Industry of this Department, and also with clover seed from different sources, and sand-binding grasses in cooperation with this Bureau; sugar-beet investigations and studies of the gluten content of wheat, in cooperation with the Bureau of Chemistry; soil investigations in cooperation with the Bureau of Soils; experiments, partly cooperative, in the rejuvenation of old orchards; preliminary investigation with concentrated feeding stuffs, and studies of new fungus diseases of fruits and beets.

A recent legislative enactment gives the State board of agriculture control of a fixed annual appropriation of $100,000 for the support of the college, substations, and farmers' institutes. From this amount, appropriations of $2,000 and $3,000, respectively, have been made for continuing the work at South Haven and Chatham during the current year. The offices in the new dairy building (Pl. II, fig. 1) for the director and agriculturist of the station give ample room for the storage and arrangement in accessible form of the station records and files Through the resignation of H. W. Mumford, assistant agriculturist of the station, experiments in stock feeding now devolve upon the director.

At the South Haven fruit substation the experiments consist mainly of variety tests of peaches, pears, plums, small fruits, and Russian watermelons, and experiments with nuts, such as chestnuts, pecans, etc. The plantation is in excellent condition. At the Chatham substation in the Northern Peninsula a residence for the superintendent and a barn (Pl. IV, fig. 1) have been completed and about 25 acres cleared and fenced. The remainder of the 160 acres is a dense forest, partly hardwood. The experiments thus far consist chiefly in growing varieties of wheat, oats, barley, alfalfa, sand lucern, peas, sorghum, vegetables, strawberries, apples, pears, etc. The work is conducted mainly for the purpose of demonstrating the agricultural possibilities of the region. It is being carefully done and is receiving cordial support from the people of the State.

INCOME.

The income of the station during the past fiscal year was as follows:

United States appropriation	$15,000.00
State appropriation	4,507.29
Fees	1,960.00
Farm products	1,516.07
Miscellaneous, including balance from previous year	733.54
Total	23,716.90

A report of the receipts and expenditures for the United States fund has been rendered in accordance with the schedules prescribed by this Department, and has been approved.

FIG. 1.—MICHIGAN COLLEGE AND STATION—DAIRY BUILDING.

FIG. 2.—IDAHO STATION—PIGGERY.

PUBLICATIONS.

The publications of this station received during the past fiscal year were Bulletins 179–188 and the Annual Report for 1900.

Bulletin 179, pp. 26, figs. 6.—Sugar-Beet Investigations.—Investigations here reported include fertilizer experiments with sugar beets on different soils at the station and in cooperation with farmers in different parts of the State, variety tests, and several culture experiments, including trials of planting at different dates.

Bulletin 180, pp. 30, pl. 1, figs. 14.—Some Insects of the Year 1899.—Economic and biological notes on 17 insects and suggestions regarding the preparation and use of the more common insecticides.

Bulletin 181, pp. 26, pl. 1, figs. 2.—Soil tests on Upland and Muck; Clover and Sand Lucern Notes; Wheat Experiments.—A report of cooperative experiments with fertilizers on corn, potatoes, field beans, and sugar beets at 13 different places in Michigan; an account of experiments on tenth and twentieth acre plants of swamp or muck land on the station farm to test the effect of different methods of fertilizing; notes on clover and sand lucern grown experimentally at the station; and the results of experiments with wheat, including a test of 12 varieties, culture experiments involving 5 different methods of preparing the seed bed, and a comparison of top-dressing and plowing under manure.

Bulletin 182, pp. 22.—A Popular Discussion of Pure Milk Supply.—Among the topics considered are the importance of pure milk for city trade and for the manufacture of butter and cheese, condition of dairies and stables of different types, germ content of milk drawn under different conditions, cooling of milk, use of preservatives, inspection and care of cows, and the construction of stables and milking rooms.

Bulletin 183, pp. 14, figs. 9.—Gassy Curd and Cheese.—A detailed account of a bacteriological study of a bacillus resembling *Bacillus coli communis*, isolated from gassy curd.

Bulletin 184, pp. 60, pls. 2, figs. 5.—Tuberculosis and its Management.—A discussion of the nature, prevalence, dissemination, geographical distribution, symptoms, etc., of tuberculosis, including the results of a number of investigations at the station; a detailed history of tuberculosis in the college herd since 1889; and suggestions regarding the management of tuberculosis.

Bulletin 185, pp. 16.—Fertilizer Analyses.—Tabulated analyses of 81 samples of fertilizers examined during 1900, with brief explanatory notes.

Bulletin 186, pp. 46, pls. 16, figs. 6.—First Report of the Upper Peninsula Experiment Station.—An account is given of the establishment and work of the Upper Peninsula Experiment Station, includ-

ing notes on culture and variety tests with different field crops, fruits, and vegetables; notes on the geology of the locality; lists of the plants, insects, spiders, and molluscs found at the substation; and a brief discussion of the characteristics of the soil of the Upper Peninsula.

Bulletin 187, pp. 48.—Report of South Haven Substation.—Results of tests of 61 varieties of raspberries, 29 blackberries, 28 currants, 20 gooseberries, 64 cherries, 113 peaches, 47 pears, 9 quinces, 47 plums, 81 grapes, 105 apples, 11 crab apples, and a number of varieties of European and Japanese chestnuts, filberts, and walnuts, with descriptive notes on many of the more important or newer varieties; and brief accounts of experiments in pruning back peach trees which had been injured by frost, experiments in thinning peaches, and spraying experiments.

Bulletin 188, pp. 14, fig. 1.—Experiments with Sugar Beets.—Tests of various kinds of soil for sugar beets, an experiment on the time of planting sugar beets, and distance, fertilizer, and variety tests conducted in 1900, on soils ranging from sand to loam.

Annual Report, 1900, pp. 478, pls. 4, figs. 62, map 1.—Reports of the director and heads of departments reviewing the work of the station during the year, a financial statement for the fiscal year ended June 30, 1900, meteorological observations, and reprints of Bulletins 175-185 of the station.

GENERAL OUTLOOK.

The Michigan Station is doing much to introduce new industries and new crops. As a result of preliminary investigations and experiments made by the station chemist, demonstrating the adaptability of Michigan soil to sugar-beet production, the State now contains 13 sugar factories, representing a total capitalization of $5,525,000. Six more companies are organized and will invest fully $2,000,000 in buildings for which contracts have been awarded. In this connection the station is now making somewhat extended investigations in the utilization of sugar factory by-products as feeding stuffs. Sand lucern has been introduced by the station, and its use as a hay crop and a green manure on light sandy soil has met with a success worthy of mention. The station has been instrumental, also, in the quite general introduction of cowpeas and soy beans on farms in the southern part of the State, and is investigating the use of these legumes with corn for silage mixtures. Tobacco is another recently introduced crop that is receiving attention at the station. In the rejuvenation of old orchards, fruit growers are working hand in hand with the station, and the results in some cases have been remarkable. The experiment in growing white pine at the college and on the plantation, about a mile away (Pl. III, figs. 1 and 2), is progressing well. The South Haven substation furnishes desired information to the fruit growers along the west coast

FIG. 1.—MICHIGAN STATION—WHITE PINE PLANTATION IN 1898.

FIG. 2.—MICHIGAN STATION—WHITE PINE PLANTATION IN 1901.

regarding varieties of fruit and methods of fighting fungus and insect enemies. The entomologist of the station has made a special study of Coccidæ, and will soon issue a monograph on scale insects. The botanist, in addition to testing seeds, has been called upon to study fungus diseases of fruits and beets in many parts of the State. The college and station are in prosperous condition, and are brought into intimate relation with the people of the State through farmers' institutes, in which the station officers participate, and through summer excursions to the college, which bring several thousand visitors each year.

MINNESOTA.

Agricultural Experiment Station of the University of Minnesota, *St. Anthony Park, St. Paul.*

Department of University of Minnesota.

GOVERNING BOARD.

Board of Regents: Greenleaf Clark (*Pres.*), *St. Paul;* Wm. M. Liggett, *St. Anthony Park;* Stephen Mahoney, *Minneapolis;* Elmer E. Adams, *Fergus Falls;* Thomas Wilson, *St. Paul;* A. E. Rice, *Willmar;* C. C. Strickler, *New Ulm;* Jas. T. Wyman, *Minneapolis;* T. L. Schurmeier, *St. Paul;* Gov. Samuel F. Van Sant, *St. Paul;* Cyrus Northrop, *Minneapolis;* John W. Olson, *Albert Lea;* J. E. Ware (*Treas.*), *Minneapolis.*

STATION STAFF.

Cyrus Northrop, LL. D., *President of the University.*

Wm. M. Liggett, *Dir.*
Willet M. Hays, M. Agr., *Agr.*
Samuel B. Green, B. S., *Hort.*
Harry Snyder, B. S., *Chem.*
T. L. Haecker, *Dairy Husb.*
M. H. Reynolds, M. D., V. M., *Vet.*
Andrew Boss, *Asst. in Agr.* (*Univ. Farm*).
F. L. Washburn, *Ent.*
T. A. Hoverstad, B. Agr., *Asst. in Agr.* (*Crookston*).
R. S. Mackintosh, *Asst. in Hort.* (*Univ. Farm*).
H. H. Chapman, B. S., B. Agr., *Asst. in Agr.* (*Grand Rapids*).
E. W. Major, *Asst. in Dairying.*
J. A. Hummel, B. Agr., *Asst. Chem.*
J. A. Vye, *Sec.*

LINES OF WORK.

The work of the Minnesota Station during the past year has been mainly along the same lines as heretofore, including field experiments with grain and forage crops, flax grown for fiber and seed, sugar beets, rotation of crops, etc.; horticultural and forestry investigations both at the main station and at the substations; entomological investigations, especially with reference to controlling an invasion of Rocky Mountain locusts; chemical studies of soils, foods, etc.; investigations in dairy farming and dairying; studies in veterinary science and practice; feeding experiments with cattle, sheep, and pigs, and breeding experiments with sheep and pigs. The station continues to conduct nutrition investigations in cooperation with this Office, and is cooperating with the Bureau of Forestry of this Department in tree planting

and with the Bureau of Plant Industry in efforts to improve the wheat industry of the Northwest.

The breeding and testing of varieties of cereals, grasses, millet, field peas, cowpeas, soy beans, etc., and the distribution of the promising varieties among the farmers for trial have developed into a well-organized system. The dairy division has continued extensive feeding experiments to determine the cost of producing milk and butter and is doing much to demonstrate to the farmers of the State methods of lowering the cost of producing butter. The Minnesota legislature at its last session made an appropriation of $90,000 for the college of agriculture. Of this sum $25,000 has been used in the construction of a veterinary laboratory, $25,000 will be used in erecting a chemical laboratory, $12,000 for an addition to the women's building, and $7,500 for a building to be devoted to instruction and experiments in curing meat. Other smaller sums will be used in bettering the dairy equipment and erecting barns at both the central station and the substations. The animal husbandman, Prof. Thomas Shaw, has recently published a book entitled Study of Breeds in America: Cattle, Sheep, and Swine. The veterinarian has retired from active management of the veterinary work for the State board of health and is now free to devote his whole time to teaching and experimenting. The station has suffered the loss of its entomologist and botanist, Dr. Otto Lugger, who died near the close of the fiscal year.

The substations at Crookston and Grand Rapids have been maintained, as heretofore, with State funds. The work of both substations is local in nature, that of the Crookston substation being confined to problems of the Red River Valley, and that of the Grand Rapids substation to forestry and general and truck farming.

INCOME.

The income of the station (including substations) during the past fiscal year was as follows:

United States appropriation	$15,000.00
State appropriation	35,956.32
Farm products	7,246.14
Total	58,202.46

A report of the receipts and expenditures for the United States fund has been rendered in accordance with the schedules prescribed by this Department, and has been approved.

PUBLICATIONS.

The publications of this station received during the past fiscal year were Bulletins 68 and 69, Class Bulletin 8, and the Annual Report for 1900.

Bulletin 68, pp. 176, pl. 1., figs. 37, dgms. 27.—Subexperiment Farms.—Notes are given on the purpose and management of the three substations in the State and results obtained at each of the farms are reported in detail. The work at the Coteau experiment farm included a study of the amount of soil moisture best suited to the growth of flax, various tillage experiments for the conservation of soil moisture, tests of a number of meadow and pasture crops, and observations on the value of shelter belts. The work at the Northwest experiment farm embraced variety tests with a number of grains, grasses, clovers, and forage crops, and experiments in seeding grasses and clovers with different nurse crops. The work at the Northeast experiment farm consisted of field tests with grains, forage crops, potatoes, vegetables, and orchard and small fruits.

Bulletin 69, pp. 259, pls. 24, figs. 196.—Bugs Injurious to Our Cultivated Plants.—A general account of the anatomy, life history, habits, and classifications of the order Hemiptera, including lice, Heteroptera, and Homoptera, and brief biological and economic notes on the more important species.

Class Bulletin 8, pp. 4.—Minnesota No. 163 Wheat.—A comparison of this wheat with other varieties, based on the results of tests made at the station.

Annual Report, 1900, pp. 772, pls. 9, figs. 296, dgms. 27.—This contains the organization list of the station; a financial statement for the fiscal year ended June 30, 1900; a general review by the director of the work of the different departments and of the experiment farms at Crookston, Grand Rapids, and Coteau; reprints of Bulletins 65-68 of the station, and meteorological observations.

GENERAL OUTLOOK.

The Minnesota Station is pursuing the well-defined policy of following up scientific investigations and research with practical application on the farms of the State. In the case of cereals and forage plants, the plan is to secure improved varieties by breeding and selection and then to distribute these varieties among the farmers. The distribution of new varieties of wheat and corn has already resulted in much good, and new varieties of flax, oats, barley, and others of wheat will soon be ready for distribution. Likewise the investigations of the dairy division on the production of milk and butter are made in the hope of giving the public methods of lessening the cost of producing these commodities. Plans and appropriations have been made for improving the equipment of the dairy building and for strengthening the course in the dairy school of the university, which has done much already to improve dairy methods in the State and to give a better reputation to Minnesota butter. Closely related to dairying and the live-stock interests generally are veterinary investigations and those in curing

meats, which are to be carried on under better facilities than formerly. Horticultural experiments and forestry investigations are going forward both at the main station and at the substations in remote parts of the State. The university with which the station is connected administers the funds appropriated by the State for farmers' institutes, the superintendent of which also cooperates with the station in conducting experiments at Coteau farm. The school of agriculture of the university continues to be well patronized and is doing good work.

MISSISSIPPI.

Mississippi Agricultural Experiment Station, *Agricultural College.* [a]

Department of Mississippi Agricultural and Mechanical College.

GOVERNING BOARD.

Board of Trustees: Gov. A. H. Longino (*Pres. ex officio*), *Jackson;* R. C. King (*Sec.*), *Agricultural College;* G. W. Carlisle (*Treas.*), *Jackson;* W. B. Montgomery, *Starkville;* H. M. Street, *Meridian;* T. C. Dockery, *Love Station;* S. D. Lee, *Columbus;* R. C. Lee, *Madison Station;* W. H. Morgan, *Sheppardtown;* J. J. Coman, *Jackson;* Henry L. Whitfield, *Jackson;* J. F. McCool, *Kosciusko;* J. B. Bailey, *Conehatta;* J. C. Hardy (*Pres. of College*), *Agricultural College;* W. L. Hutchinson, *Agricultural College.*

STATION STAFF.

J. C. Hardy, *President of the College.*

W. L. Hutchinson, M. S., *Dir.; Chem.*
E. R. Lloyd, M. S., *Asst. Dir.; Agr.*
G. W. Herrick, B. S., *Bot. and Ent.*
A. B. McKay, B. S., *Hort.*
J. C. Robert, D. V. M., *Vet.*
W. R. Perkins, M. S., *Assoc. Chem.*
J. S. Moore, M. S., *Dairy Husb.*
C. T. Ames, B. S., *Asst. Hort.*
R. C. King, B. S., *Treas.*
Miss Maud Butler, *Sten.*

LINES OF WORK.

The work of the Mississippi Station during the past year has been mostly a continuation of investigations begun in former years, and has included soil studies; investigations in beef and mutton production; dairying; diseases of live stock; variety tests of orchard and small fruits, cotton, corn, and wheat; and investigations of injurious insects and artesian waters. The soil studies have comprised investigations on the chemical and physical composition of the various types and formations of soils in the State; investigations of the plant-food content in, and productiveness of, the several typical soils; experiments in the use of commercial fertilizers, manures, and restorative crops for the improvement of soils; experiments in the use of graded embankments, level embankments, and terraces for the prevention of soil washing. In this connection experiments and demonstrations in constructing dirt roads have been made. The experiments in beef and mutton production have included, in part, breeding experiments with native and grade cattle and sheep, feeding experiments with dif-

[a] Freight and telegraph address, *Starkville.*

ferent combinations of Southern forage plants and feeding stuffs, and investigations and demonstrations of the advantages of stock raising for maintaining soil fertility. Experiments in immunizing Northern cattle to Texas fever have been continued. The experimental peach orchard is now in fine condition and is being used for variety, cultural, and pruning experiments. Special attention is being given to tests of varieties of strawberries. Among other experiments may be mentioned rotations with burr, white, and alsike clover, Melilotus, Lespedeza, water grass (*Paspalum dilatatum*), and a number of other grasses for pasture; and experiments in handling milk under Southern conditions. The inspection of commercial fertilizers is under the supervision of the professor of chemistry in the agricultural college, who is also State chemist. The chemist of the station is studying methods of analysis for nitrogen in cooperation with the Bureau of Chemistry of this Department.

INCOME.

The income of the station during the past fiscal year was as follows:

United States appropriation	$15,000.00
Farm products	632.74
Miscellaneous, including balances from previous year	924.24
Total	16,556.98

A report of the receipts and expenditures for the United States fund has been rendered in accordance with the schedules prescribed by this Department, and has been approved.

PUBLICATIONS.

The publications of this station received during the past fiscal year were Bulletins 62–67 and the Annual Report for 1900.

Bulletin 62, pp. 8.—Varieties of Cotton.—Detailed data regarding the yield, value, and commercial classification of 24 varieties of cotton tested in 1899, with a summary of the results of variety tests with cotton for 10 years.

Bulletin 63, pp. 11, fig. 1.—Inoculation of Soils.—An account of soil inoculation experiments with hairy vetch, with some general remarks on relation of air to plants, methods of inoculating the soil, etc.

Bulletin 64, pp. 32.—Inspection and Analyses of Fertilizers.—Tabulated analyses and valuations of 211 samples of fertilizers, with explanatory notes.

Bulletin 65, pp. 19, figs. 3, map 1.—Soils of Mississippi.—Chemical and mechanical analyses of 375 samples of representative soils from different parts of the State, with a map showing the location and extent of the different soil areas and a discussion of the analytical results.

Bulletin 66, pp. 23, pls. 2, figs. 4, map 1.—Soils of Mississippi.—Analyses of 76 samples of prairie soils and 46 samples of sandy and

sandy loam soils showing the content of phosphoric acid, potash, nitrogen, and lime; an explanation of the construction and use of embankments and terraces to prevent washing of soils; and a discussion of the reclamation of washed lands, the value and use of stable manure, the restoration of crops, and the use of commercial fertilizers.

Bulletin 67, pp. 16, pl. 1, figs. 5.—Good Dirt Roads for Mississippi.—The road laws of Mississippi are briefly summarized and the system of road maintenance of the State is discussed. Methods of building and maintaining dirt roads are briefly explained.

Annual Report, 1900, pp. 126, figs. 3.—This includes the organization list of the station; a financial statement for the fiscal year ended June 30, 1900; a general report on station work during the year by the director, and more detailed reports by the heads of departments containing results of variety tests with cotton and wheat, and culture experiments with sorghum, cowpeas, and corn, an account of feeding experiments with steers to determine the comparative value of different feeding stuffs, a record of the dairy herd for one year, results of a test of feeding grain to dairy cows on pasture, notes on inoculation experiments for the prevention of Texas fever, and on the occurrence of black-leg, anthrax, glanders, and tuberculosis in the State, and notes on several insect pests and plant diseases. Reprints of Bulletins 60 and 62–64 of the station are appended.

GENERAL OUTLOOK.

The station is wisely continuing active operations for the improvement of soils throughout the State, and to this end is demonstrating the value of animal production and the use of manures, fertilizers, restorative crops, and rotations to increase productiveness, and the efficacy of embankments and terraces to prevent soil washing. Other related problems, such as forage production, dairying, studies of Texas fever, and of means for combating insect pests are given such prominence as their importance demands, and at the same time the station is making helpful investigations in the production of fruit, corn, wheat, and cotton. During the year 8 members of the college and station staffs assisted at 23 farmers' institutes. The institute work is growing in importance, and should receive more liberal support from the State.

MISSOURI.

Missouri Agricultural College Experiment Station, *Columbia.*

Department of the College of Agriculture and Mechanic Arts of the University of the State of Missouri.

GOVERNING BOARD.

Board of Curators—Executive Committee: R. B. Oliver (*Pres.*), *Cape Girardeau;* Campbell Wells, *Platte City;* G. F. Gmelich, *Boonville.*

Advisory Council: The Missouri State Board of Agriculture.

STATION STAFF.

R. H. Jesse, LL. D., *President of the University.*

Henry J. Waters, B. S. A., *Dir.*
Paul Schweitzer, PH. D., *Chem.*
J. C. Whitten,[a] B. S., *Hort.*
J. M. Stedman, B. S., *Ent.*
J. W. Connaway, M. D. C., *Vet.*
C. H. Eckles, B. AGR., M. S., *Dairying.*
W. L. Howard, B. S., *Asst in Hort.*
C. Thom, PH. D., *Asst. Bot.*
John Schnabel, *Gard.*
J. G. Babb, M. A., *Sec.*
R. B. Price, *Treas.*
Miss Estelle Hickok, *Clerk and Sten.*

LINES OF WORK.

The work of the Missouri Station during the past year has been continued along practically the same lines as formerly, and has included field experiments with cereals, forage crops, fertilizers, rotation of crops, systems of drainage, methods of renovating worn-out soils, etc.; field, greenhouse, and laboratory experiments in horticulture; a study of the influence of crossing different types of sheep with native ewes upon the weight and quality of the carcass and wool of the offspring; feeding experiments with beef cattle; investigations of animal diseases, including experiments in immunizing Northern pure-bred cattle against Texas fever by blood inoculation and tick infestation, and a study of the life histories of and remedies for animal parasites, such as the tapeworm of sheep and the lung and stomach worms of sheep and cattle; chemical study of food adulterants, the artifical method of determining the digestibility of feeding stuffs as compared with the use of animals for this purpose, and the composition, fuel value, and feeding value of the different animal and vegetable fats of commerce; mechanical tests of farm wagons and spray nozzles; entomological studies, especially of insects affecting fruit; experiments in selection, amelioration, and cultivation of edible nuts; experiments with fruits, including variety tests of apples, plums, grapes, peaches, pears, and small fruits, and tests of commercial fertilizers in nurseries and bearing orchards in different parts of the State, and breeding experiments with the peach, plum, persimmon, strawberry, grape, and tomato. The inspection of commercial fertilizers has been continued under State laws. The station has assisted the State board of agriculture in regulating the sale of artificial butter and in the enforcing of State laws against infectious diseases of live stock. It has also cooperated with the State Horticultural Society in the inspection of nursery stock. Besides these lines of work, many of which have been in progress for a number of years, the station has recently undertaken irrigation investigations in cooperation with this Office, an investigation of the gluten content of wheat in cooperation with the Bureau of Chemistry of this Department, and studies on the influence of origin of red-clover seed on yield of crop

[a] On leave.

and the formation and management of meadows and pastures in cooperation with the Bureau of Plant Industry of this Department.

The State legislature at its last session made liberal appropriations to the university, over $100,000 being provided for the agricultural department. Of this, $40,000 is given for a dairy and live-stock building and equipment, and an equal amount for a horticultural, entomological, and botanical building and equipment, both of which will be of direct benefit to the station in furnishing quarters and equipment for its different departments. The appropriation also carried $3,500 for maintenance of the station, to be used as a printing fund to carry out the provisions of the law authorizing the printing of station publications by the State printer, and $5,000 for work in dairying, including the establishment of a chair of dairy husbandry in the college of agriculture.

INCOME.

The income of the station during the past fiscal year was as follows:

United States appropriation	$15,000.00
Farm products	2,676.99
Fees	1,373.30
Balance from previous year	2,711.25
Miscellaneous	20.15
Total	21,781.69

A report of the receipts and expenditures for the United States fund has been rendered in accordance with the schedules prescribed by this Department, and has been approved.

PUBLICATIONS.

The publications of this station received during the past fiscal year were Bulletins 49 and 50.

Bulletin 49, pp. 21, pls. 2, figs. 4.—The Apple Orchard.—An account of experimental work conducted at the station during 5 years in regard to the preparation of the soil for apple orchards and the relation of cultivation and care to the development and growth of apple trees, together with a discussion of different crops for growing in orchards and the value of different cultural methods.

Bulletin 50, pp. 31, pls. 7, figs. 3.—A Test of Spray Nozzles.—A comparative study was made of 30 kinds of nozzles from different manufacturers, with reference to the following points: Height of spray or distance which the spray could be thrown perpendicularly with various pressures; width, shape, and distribution of the spray at the point where it was considered most efficient; size of the drops; amount of liquid discharged by each nozzle in a given time; liability of the nozzle to clog; liability to dribble; durability, and method of attachment.

GENERAL OUTLOOK.

The Missouri Station has continued to direct its work along two important lines—fruit growing and animal production. A bulletin on the apple orchard has been published which embodies the results of five years of experimental work in the cultivation and care of the orchard. The importance of this work and of the fruit interests of the State has been recognized by the State legislature in an appropriation of $26,000 for the establishment and maintenance in southern Missouri of a fruit experiment station which will relieve, to a certain extent, the college station of its investigations in that section. In animal production the station has undertaken to breed up a herd of cattle immune to Texas fever. A tick-infested pasture is maintained for immunizing in the natural way as compared with blood inoculation. The veterinarian, in cooperation with the entomologist, is giving special attention to studies of intestinal parasites of cattle and sheep. Considerable attention is being given also to experiments with corn stover variously treated and in combination with other forage plants for wintering and fattening cattle, and to experiments in the use of rotations and the establishment and maintenance of pastures.

Station officers take part in farmers' institutes and other forms of college extension work. A feature of the latter has been the effort to introduce instruction in elementary agriculture into the rural schools. This work has met with such popular approval that chairs of agriculture for the training of public-school teachers have been established in the three State normal schools.

Missouri State Fruit Experiment Station, *Mountain Grove.*

GOVERNING BOARD.

Trustees: J. C. Kerby (*Pres.*), *West Plains;* T. M. Culver (*Sec.*), *Koshkonong;* C. D. McAfee (*Treas.*), *Springfield.*

STATION STAFF.

J. T. Stinson, B. S., *Dir.* Frank Horsfall, B. S., *Asst.*
A. M. Swartwout, *Foreman.*

LINES OF WORK.

The Missouri State Fruit Experiment Station was established by the Fortieth General Assembly of the State (1899–1900), and work was begun February 1, 1900. The law establishing the station stipulated that it be located in the Ozark region of southern Missouri, and further provided that the station should test different fruits and have charge of the orchard inspection work of the State. A tract of land containing 190 acres, 60 of which are improved, has been secured, buildings have been erected, and testing grounds and orchards are being planted as rapidly as possible. The buildings include the

experiment station building (Pl. IV, fig. 2), residences for the director and the foreman, and a barn. The station building is of red pressed brick and contains the experiment station offices, two large laboratory rooms, and a museum room.

The work already undertaken includes variety tests, improvement of varieties by selection, originating new varieties by cross pollenization, and the study of diseases and insects injurious to fruits. A careful study is being made of the orchard conditions of the Ozark region, and cooperative orchard work in spraying and cultivation has been started. In executing the inspection laws of the State the station is required to treat or destroy orchards infected with scale insects or dangerous diseases.

INCOME.

The station is supported entirely by State appropriation, the amount for the years 1901 and 1902 being $26,525.

PUBLICATIONS.

The publications of this station received during the past fiscal year were Bulletin 1 and the Annual Report for 1900.

Bulletin 1, pp. 21.—Preliminary Report on the Bitter Rot of Apples.—This bulletin gives the results of experiments carried on at the station to prevent bitter rot of apples, and contains information concerning the disease collected from apple growers in different parts of the country.

First Annual Report, 1900, pp. 20.—This report consists of two parts—a communication from the board of trustees to the Forty-first General Assembly of Missouri, and a report from the director to the board of trustees. The trustees report the selection of a site for the experiment station, the purchase of land, election of manager and inspector, erection of buildings, and progress of the experiment station; recommend changes in the law governing the station, and submit estimates for appropriations. The director reviews the work of the station and submits a statement of receipts and expenditures for the year ended December 31, 1900.

GENERAL OUTLOOK.

The production of fruit, especially apples, is one of the two important agricultural industries of the State, and southwestern Missouri is especially well adapted to this industry. The experiment station at Columbia has conducted investigations on the subject of fruit growing and has been aided in the work by the State Board of Agriculture and the State Horticultural Society. The establishment of the State Fruit Experiment Station at Mountain Grove shows the popularity of investigations of this nature and will supplement the work of the Columbia station in the region in which the new station is located.

FIG. 1.—MICHIGAN STATION—BUILDINGS AT CHATHAM SUBSTATION.

FIG. 2.—MISSOURI STATE FRUIT EXPERIMENT STATION BUILDING.

MONTANA.

Montana Agricultural Experiment Station, *Bozeman.*

Department of Montana Agricultural College.

GOVERNING BOARD.

Executive Board: Walter S. Hartman (*Pres.*), *Bozeman;* Peter Koch (*Sec. and Treas.*), *Bozeman;* John M. Robinson, *Bozeman;* Joseph Kountz, *Bozeman;* E. B. Lamme, *Bozeman.*

STATION STAFF.

Rev. James Reid, B. A., *President of the College.*
S. Fortier, M. E., *Dir.; Irrig. Engin.*
F. W. Traphagen, PH. D., *Chem.*
Robert S. Shaw, B. S. A., *Agr.*
Henry C. Gardner, *Asst. Agr.*
Edmund Burk, *Asst. Chem.*
J. W. Blankinship, PH. D., *Bot.*
Robert A. Cooley, B. S., *Zool.*
E. J. S. Moore, *Asst. Ent.*
M. A. Lamme, *Sten. and Clerk.*

LINES OF WORK.

The work of the Montana Station during the past year has been continued along the same lines as formerly, and has included irrigation investigations; the introduction and testing of improved varieties of cereals, root crops, and forage plants; rotation experiments; feeding experiments with steers and lambs in carload lots for shipment; chemical investigation of sugar beets, alkali soils, alkali limit of plant growth, irrigation and alkali waters, soils, etc.; entomological work; botanical study of weeds, poisonous plants, ornamentals, forage plants, and parasitic fungi; poultry work; and horticultural work, especially the introduction of varieties suited to the climate of the State. The irrigation investigations included experiments with different crops, experiments in pots to determine the effect on plant growth of tailings water and tailings sediment from mines, and work in cooperation with this Office in the Bitterroot Valley and on the Yellowstone. The station is also cooperating with farmers in testing new varieties and in sugar-beet work, with the Bureau of Plant Industry of this Department in the study of plants poisonous to stock, and with the Bureau of Forestry in tree planting.

The station has been very successful in growing clover and is exercising a most noticeable influence on the farmers in the direction of doing away with summer fallowing and growing clover instead. The station supervises the hydrographic work of the U. S. Geological Survey in Montana and makes all measurements of streams in the State. It is now the only irrigation bureau in the State and the irrigators depend upon it for information. The station is planning to buy a herd of dairy cows and has been given $2,500 by the State legislature for the erection of a dairy building, the equipment for which is partly on hand. The legislature has also given $2,000 a year for the support of farmers' institutes, which will be in charge of a board, of which the director of the station is secretary.

INCOME.

The income of the station during the past fiscal year was as follows:

United States appropriation	$15,000.00
State appropriation	200.00
Farm products	3,549.04
Total	18,749.04

A report of the receipts and expenditures for the United States fund has been rendered in accordance with the schedules prescribed by this Department, and has been approved.

PUBLICATIONS.

The publications of this station received during the past fiscal year were Bulletins 22–29.

Bulletin 22, pp. 42.—The Resistance of Strawberries to Frost, and Twelve Other Subjects.—A discussion, with original observations and results of experiments, of the following subjects: The resistance of strawberries to frost, potato scab, treatment of seed oats for smut, losses caused by the grain aphis, roup of chickens, the internal chicken mite, lupines as plants poisonous to stock, cattle poisoning by the tall larkspur, poisoning of stock by the water hemlock, ergotism in horses, the poisoning of cattle by smutty oat hay, list of plants of known or suspected poisonous properties which occur within the State, and some native forage plants of the State.

Bulletin 23, pp. 53, figs. 38.—Injurious Fruit Insects; Insecticides; Insecticide Apparatus.—Brief popular notes on some 15 insects injurious to fruits, directions for the preparation and use of the common insecticides, and descriptions of spraying apparatus.

Bulletin 24, pp. 38.—Annual Report, 1899.—This includes the organization list of the station; a financial statement for the fiscal year ended June 30, 1899; a report of the director on the work and publications of the station during the year; and departmental reports, that of the horticulturist giving notes on various orchard fruits, an account of a test of the Stringfellow method of root pruning, and results of a test of 61 varieties of strawberries, that of the assistant agriculturist giving data for tests of 66 varieties of wheat, 44 of oats, and 21 of barley.

Bulletin 25, pp. 7.—Paris Green and London Purple in Montana.—Analyses of 6 samples of Paris green and 2 samples of London purple bought of dealers in the State.

Bulletin 26, pp. 28, pls. 5, figs. 2, dgms. 2.—Poultry Raising.—The station poultry equipment is described and general statements are made concerning breeds, incubation, buildings, brooders, and similar topics. Tests are reported of the relative merits of a lime-and-salt solution and a solution of water glass for preserving eggs and of the

comparative value of a rather varied ration, a meat ration, a vegetable ration, and a ration of grain alone. The percentage of fertility and analyses of the eggs obtained in the feeding experiments are reported.

Bulletin 27, pp. 32.—Live Stock Feeding Tests.—Details and results of feeding experiments with (1) 16 steers to learn whether local farm products can profitably be used in finishing range steers for market, and to what extent it is profitable to use grain with clover in a fattening ration, and to compare the relative values of typical beef animals as meat producers with those conforming to the dairy type; (2) 60 lambs to test the value of grain supplementing clover in feeding lambs for market; and (3) 21 pigs to compare feeding grain alone, grain with sugar beets, and grain with alfalfa.

Bulletin 28, pp. 24.—Annual Report, 1900.—This contains the organization list of the station; a financial statement for the fiscal year ended June 30, 1900; a list of exchanges; subject list of station bulletins, and reports of the director and heads of departments, that of the horticulturist giving lists of the hardy, semihardy, and poor or useless ornamental shrubs and fruits grown at the station, and brief notes on several experiments in progress, that of the agriculturist giving the yields of field crops grown under the Campbell system and under general methods of culture and in rotation experiments.

Bulletin 29, pp. 44, pls. 10.—The Quantity of Water Used in Irrigation and the Seepage Loss from Canals.—This is an account of investigations made during 1900 under the supervision of the expert in charge of irrigation investigations of this Office. Records are given of observations on the duty of water in the Gallatin and Bitter Root Valleys, in Yellowstone County, and in Middle Creek Canal. A study of the losses due to seepage and evaporation on five canals, and their relation to the duty of water, is reported, and conditions affecting seepage are discussed. Results for one year of a series of experiments undertaken to determine the proper amount of water to apply to growing crops. and the proper time to irrigate, are also given.

GENERAL OUTLOOK.

The Montana Station has a considerable amount of valuable work in hand, and is keeping itself before the farmers by means of articles prepared for papers, press notices, and successfully conducted farmers' institutes. The institutes were much better attended last year than formerly, and more interest has been aroused by them. The correspondence of the station has increased greatly, and there are many evidences of the good will of stockmen and farmers toward it. As the work of this station grows in importance, it is evident that increased financial support should be given to the institution with which it is connected, in order that the station officers may be relieved from college duties to such an extent as to permit them to devote themselves more fully to the station business.

NEBRASKA.

Agricultural Experiment Station of Nebraska, *Lincoln.*

Department of the University of Nebraska.

GOVERNING BOARD.

Regents of the University: E. von Forell (*Pres.*), *Kearney;* Geo. F. Kenower, *Wisner;* Edson C. Rich, *Omaha;* John L. Teeters, *Lincoln;* Elisha C. Calkins, *Kearney;* Carl J. Ernest, *Lincoln.*

STATION STAFF.

E. Benjamin Andrews, LL. D., *Chancellor of the University.*

E. A. Burnett, B. S., *Dir.; Animal Husb.*
T. L. Lyon, B. S. A., *Assoc. Dir.; Agr.*
H. H. Nicholson, M. A., *Chem.*
C. E. Bessey, Ph. D., *Bot.*
Lawrence Bruner, B. S., *Ent.*
E. H. Barbour, Ph. D., *Geol.*
A. T. Peters, D. V. M., *Animal Path.*
G. D. Swezey, M. A., *Met.*
O. V. P. Stout, C. E., *Irrig. Engin.*
A. T. Wiancko, B. S. A., *Asst. Agr.*
R. A. Emerson, B. S., *Hort.*
A. L. Haecker, B. S., *Dairy Husb.*
Henry B. Slade, B. A., *Asst. Chem.*
J. H. Gain, M. D. C., *Asst. in Animal Path.*
H. R. Smith, B. S., *Asst. Animal Husb.*
S. W. Perin, *Foreman of Farm.*
J. S. Dales, M. Ph., *Financial Sec.*
W. W. Marshall, *Executive Clerk.*

LINES OF WORK.

The work of the Nebraska Station during the past year has included investigations in chemistry, botany, soils, horticulture, forestry, stock feeding, field crops, animal diseases, entomology, and irrigation. The horticulturist is making a comparative test of irrigation, no irrigation, and mulching with fruits and vegetables; developing fruits, vegetables, and ornamentals that will withstand dry summers and cold winters; and conducting orchard experiments with different methods of culture with and without cover crops. In animal husbandry special attention is being given to the feeding of cattle, sheep, and pigs, and to testing the different forage plants for soiling and pasture in connection with dairy cows. The pathological investigations include work with the cornstalk disease, sorghum poisoning, hog cholera, and blackleg. The work in agronomy includes studies of methods for conserving soil moisture; the production of forage crops adapted to regions of limited rainfall; the improvement of winter wheat, corn, oats, and sugar beets; and the maintenance of soil fertility by the use of manures, leguminous crops, and rotations. The chemist has devised a rapid method for the determination of sugar in beets, and a mechanical device for collecting precipitates.

The station is cooperating with this Office in irrigation investigations; with the Bureau of Plant Industry of this Department in the cultivation and improvement of native grasses and in an investigation of the influence of environment on plants; with the Division of Entomology in the study of means for destroying locusts and grasshoppers, including the use of the grasshopper fungus disease; and with the

Bureau of Forestry in tree planting. The station also cooperates with a large number of farmers in making tests of various grains, remedies for injurious insects and diseases of fruits, and methods of cultivating and otherwise handling orchards. For its investigation of the cornstalk disease and sorghum poisoning of cattle the station has received a special State appropriation of $2,500. The veterinarian believes that the cause of cornstalk disease is the presence of poisonous weeds (black nightshade and water hemlock) in the fodder. In the investigation of sorghum poisoning chemical and bacteriological studies are now being made in the hope of discovering the cause of deaths. The veterinarian is investigating methods of rendering hogs immune from hog cholera. Recent experiments lead him to believe that unborn pigs can be immunized by inoculating the mother about two weeks before farrowing time with a virulent culture, provided the sow be already immune. Since January 1, 1901, the station has distributed over 60,000 doses of blackleg vaccine to people in the State. The appointment of a State veterinarian has relieved the station veterinarian from considerable routine business.

At the close of the fiscal year the chancellor of the university retired from the directorship of the station, and Prof. E. A. Burnett, animal husbandman, was made director. At the same time both the animal husbandman and the agriculturist were given assistants. The animal husbandman had charge of farmers' institutes in the State last year, and other members of the station staff assisted in the work.

INCOME.

The income of the station during the past fiscal year was as follows:

United States appropriation	$15,000.00
Farm products	1,205.77
Balance from previous year	689.01
Total	16,894.78

A report of the receipts and expenditures for the United States fund has been rendered in accordance with the schedules prescribed by this Department, and has been approved.

PUBLICATIONS.

The publications of this station received during the past fiscal year were Bulletins 65–70.

Bulletin 65, pp. 26, figs. 8, map 1.—Blackleg: Its Nature, Cause, and Prevention.—A popular discussion of the etiology, symptoms, treatment, etc., of blackleg, with detailed directions for making preventive vaccinations against this disease.

Bulletin 66, pp. 16.—Sheep Feeding Experiments in Nebraska.—An account of feeding experiments with 100 sheep to determine the value

of different combinations of corn and other grains with alfalfa hay and prairie hay.

Bulletin 67, pp. 8, pls. 2.—Experiments in the Culture of the Sugar Beet.—A summary of the results of culture, fertilizer, and variety tests with sugar beets during the season.

Bulletin 68, pp. 8.—Feeding Skim Milk to Calves.—A detailed account of an experiment with 6 calves conducted to ascertain the profit of raising beef calves on separator milk.

Bulletin 69, pp. 13, figs. 13.—Some Forage Plants for Summer Feed.—A report on experiments with a number of forage plants for the purpose of determining their relative value for pasturage and for soiling, and comparing the value of certain of these crops for milk and butter production under the two systems of feeding.

Bulletin 70, pp. 12, figs. 13.—Locusts or Grasshoppers.—An analytical table for the purpose of assisting in the identification of 10 common species of grasshoppers in the State, notes on the life history of grasshoppers, and a discussion of fungus diseases and artificial means for destroying them.

GENERAL OUTLOOK.

The experimental work of the Nebraska Station is each year assuming a more definite and fixed character. The tendency is for the different departments to unite their efforts on certain problems and study them from different points of view. Thus the irrigation engineer, the horticulturist, and the agriculturist are studying different phases of the problem of irrigation; likewise the horticulturist and the entomologist are cooperating in orchard work, and the chemist and the botanist are assisting several other members of the staff. A large part of the work has been directed toward the investigation of problems of plant production in regions where the winters are cold and the summers subject to drought. This work is of special importance in view of the extensive production of live stock in the State, and so, too, are the feeding experiments, dairy investigations, and the study of diseases of animals. It is very encouraging to have the State make a special appropriation for investigations by the station. The university is also contributing liberally to the support of the station.

During the year considerable attention has been given to systematizing the business affairs of the station and revising the mailing list, which has quadrupled during the last two years. This evidence of increasing interest in the work of the station, together with the differentiation of its organization and the liberal attitude of the university toward it, makes the outlook of the station very promising for increased usefulness to the farmers of the State.

NEVADA.

Nevada Agricultural Experiment Station, *Reno.*

Department of Nevada State University.

GOVERNING BOARD.

J. N. Evans (*Pres.*), *Reno;* W. E. F. Deal, *Virginia City;* W. W. Booher, *Elko.*

STATION STAFF.

Joseph E. Stubbs, M. A., D. D., *President of the College and Director.*
Ransom H. McDowell, B. S., *Agr. and Animal Husb.*
Nathaniel E. Wilson, M. S., *Chem.*
Peter Fransden, B. A., *Zool. and Bact.*
P. Beveridge Kennedy, *Bot. and Hort.*
Elizabeth Spayd Stubbs, *Sten.*
Samuel B. Doten, *Ent.*
Theodore Clark, *Foreman Farm.*
H. H. Dexter, B. A., *Libr.*

LINES OF WORK.

The lines of work pursued at the Nevada Station during the past year included field experiments, with and without irrigation, with cereals, alfalfa, and forage plants gathered from the valleys and bench lands; botanical study of forage problems on sheep ranges of the Sierra region and of grasses in the vicinity of Reno; entomological study of an onion maggot, cutworms injurious to alfalfa, and the flat-headed apple borer. In cooperation with the Bureau of Plant Industry of this Department the department of botany and horticulture has undertaken the improvement of native grasses; the development of a drought-resistant variety of alfalfa; and tests of the value of salt-bushes in Nevada, of the best grasses for meadows, and of drought-resistant grasses for ranges. Irrigation investigations have been continued in cooperation with this Office. An instrument for carefully measuring the water used has been installed, and the agriculturist is to be given an assistant for irrigation work, whose salary is to be paid out of funds appropriated by the State for irrigation investigations.

The station was badly crippled by the fire of August, 1900, which destroyed the station building, together with the valuable botanical and entomological collections and part of the books and laboratory equipment used by the station officers. The latter now occupy the former Mines Building, which furnishes good quarters for all of the departments except that of chemistry. The State, however, has given $12,000 for a new chemical building, which will be completed during the coming winter, and will furnish adequate laboratory facilities for the chemical work of the station. During the year six members of the staff have taken part in farmers' institutes. Nature-study work has been undertaken by the university with promise of success.

INCOME.

The income of the station during the past fiscal year was as follows:

United States appropriation	$15,000.00
Farm products	430.65
Miscellaneous, including balance from previous year	572.88
Total	16,003.53

A report of the receipts and expenditures for the United States fund has been rendered in accordance with the schedules prescribed by this Department, and has been approved.

PUBLICATIONS.

The publications of this station received during the past fiscal year were Bulletins 46–50.

Bulletin 46, pp. 15, figs. 24.—Flowers and Fruits of Common Trees and Shrubs.—The general structures of flowers and fruits are described and the flowers and fruits of a number of the more common trees and shrubs are figured and discussed.

Bulletin 47, pp. 90, figs. 92.—Clover Seeds and Their Impurities.—Results of extended studies of clover seed and its impurities, including illustrations and descriptions of the different kinds of clover seed, kinds and amounts of weed seeds found in different samples of clover seed examined, and illustrations and detailed descriptions of the different weed seeds.

Bulletin 48, pp. 10, figs. 15.—Some Ways of Seed Distribution.—A popular description of some of the methods by which seeds of weeds and other plants are distributed.

Bulletin 49, pp. 12, pls. 2, figs. 5.—The Carpenter Worm.—A description of the carpenter worm in its various stages, with notes on the injury done by this insect, and a discussion of remedial measures.

Bulletin 50, pp. 13, figs. 3.—Notes on Sugar Beets for 1899.—A brief report on several cooperative culture tests with sugar beets and general notes on the sugar-beet industry in the State.

GENERAL OUTLOOK.

Owing to the destruction of equipment and other facilities for work, but little scientific investigation has been conducted during the year. However, the difficulties arising from the fire will soon be overcome and already considerable interesting work has been outlined. This includes irrigation investigations, experiments in range improvement, chemical study of the nutritive and poisonous qualities of range plants, field work to determine the food plants of range sheep, and a soil survey of the State. In addition, a kind of institute work, or, more properly, an agricultural reconnoissance of the State is contemplated.

NEW HAMPSHIRE.

New Hampshire College Agricultural Experiment Station, *Durham.*

Department of New Hampshire College of Agriculture and Mechanic Arts.

GOVERNING BOARD.

Board of Control: John G. Tallant (*Chair.*), *Pembroke;* Henry W. Keyes, *Haverhill;* George A. Wason, *New Boston;* Charles W. Stone (*Sec.*), *Andover;* Charles S. Murkland (*Pres.*), *Durham.*

STATION STAFF.

Charles S. Murkland, M. A., Ph. D., *President of the College.*

W. D. Gibbs, M. S., *Dir.; Agr.*
Fred W. Morse, M. S., *V. Dir.; Chem.*
Frank W. Rane, B. Agr., M. S., *Hort.*
Charles H. Pettee, M. A., C. E., *Met.*
Herbert H. Lamson, M. D., *Bact.*
A. Williams, *Asst. in Dairy Husb.*
Clarence M. Weed, D. Sc., *Ent.*
Harry A. Clark, B. S., *Asst. Chem.*
A. F. Conradi, *Asst. Ent.*
Frederick C. Keith, *Clerk.*
Harry F. Hall, *Gardener.*

LINES OF WORK.

The lines of work pursued at the New Hampshire Station during the past year have been much the same as in previous years. Attention has been given mainly to the study of silage and the ripening of fruits; field experiments, including tests of forage crops, rotation, tillage, and methods of using barnyard manure; feeding experiments with horses and dairy cows, including the keeping of individual dairy records; horticultural investigations, including tests of varieties of corn, potatoes, strawberries, and tomatoes, and experiments in forcing greenhouse crops; study of plant diseases and the bacteria and fungi causing changes in silage and the decay of fruits; entomological investigations, including experiments in the suppression of insect pests and studies of the life zones of the principal insects of the State; and the continuation of the comparison of different grades of gravel for roads.

The station is continuing chemical and bacteriological studies of apples with reference to the keeping qualities of different varieties, causes of decay, etc., under commercial cold-storage conditions. It is also making experiments in the improvement of old pasture lands and studies of the origin of red-clover seed in cooperation with the Bureau of Plant Industry of this Department. It continues to cooperate with the State board of agriculture in the inspection of fertilizers and the enforcement of laws relating to oleomargarine, but under a law passed by the State legislature, approved February 20, 1901, the inspection of oleomargarine and other food products, water supplies, milk, etc., will henceforth be in charge of the State Laboratory of Hygiene. The same legislature also amended the fertilizer law, making it conform more closely with the laws enforced in other New England States, and passed an act to regulate the sale of concentrated commercial feeding

stuffs, to take effect December 1, 1901. These laws are to be enforced by the secretary of the State board of agriculture, the station doing the chemical work and receiving out of the fees the actual cost of the work.

Numerous changes in the personnel of the station have occurred. C. W. Burkett, agriculturist, and his assistants, F. S. Johnston and H. B. Richardson, have resigned to accept similar positions in North Carolina and Indiana, respectively. Prof. W. D. Gibbs, of the Ohio State University, has been made director and agriculturist of the station, and several other changes have been made.

INCOME.

The income of the station during the past fiscal year was as follows:

United States appropriation	$15,000.00
Fees, including balance from previous year	483.36
Total	15,483.36

A report of the receipts and expenditures for the United States fund has been rendered in accordance with the schedules prescribed by this Department, and has been approved.

PUBLICATIONS.

The publications of this station received during the past fiscal year were Bulletins 76–79.

Bulletin 76, pp. 11, pl. 1, figs. 7.—Utilizing the Greenhouse in Summer.—A brief account of growing tomatoes, muskmelons, celery, cucumbers, sweet potatoes, eggplant, and peppers under glass in summer.

Bulletin 77, pp. 16, pl. 1, fig. 1.—Experiments in Road Surfacing.—Comparative tests during 2 years of various surfacing materials, including gravel of different kinds, screened and unscreened, clay, sand, point rock, and stones 2 to 6 inches through, applied during the spring of 1898, are reported, and the difference between macadam, gravel, and earth roads is briefly explained.

Bulletin 78, pp. 18, pl. 1.—Bovine Tuberculosis.—Brief popular notes are given on the cause, methods, and sources of infection, methods of transmission, diagnosis, and pathological lesions of this disease. The results of tuberculin tests applied to the college herd are tabulated, and experiments in inoculating milk of tuberculous cows into guinea pigs are reported.

Bulletin 79, pp. 38, pl. 1.—Annual Report, 1900.—This contains a financial statement for the fiscal year ended June 30, 1900, and departmental reports for the year ended October 31, 1900. The report of the vice-director and chemist contains analyses of sunflower seeds, several poultry foods, seaweed, and of maple sirup from defoliated trees, with notes on the different substances examined. The report of the horticulturist gives tabular data and descriptive notes on 60 varieties of

potatoes and 29 of tomatoes tested during the season. The report of the agriculturist includes a summary of the record of the college dairy herd during the year. The report of the bacteriologist gives notes on the decay of apples, with the results of experiments in cold storage, and a record of silo temperatures taken by electricity, with a description of the apparatus used. A subject list of station publications available for distribution and a summary of meteorological observations complete the report.

GENERAL OUTLOOK.

The efforts of the New Hampshire Station are directed toward the improvement of agricultural practice in that State. Farms are old, hence the importance of fertilizer investigations, tests of methods of renovating old orchards, and the experiments in the improvement of old meadows taken up in cooperation with farmers. Apples, strawberries, potatoes, hay, dairy products, and garden truck are staple products, and their culture and improvement hold leading positions among the subjects for investigation at the station. The transfer of part of the inspection work to the State Laboratory of Hygiene relieves the station staff of burdensome duties. The station was seriously crippled in its work during the summer by the resignation of the agriculturist and his two assistants, as well as by other staff changes. Several series of experiments covering a term of years have, however, been completed, and it is hoped that the results will be published before long.

NEW JERSEY.

New Jersey State Agricultural Experiment Station, *New Brunswick.*

At Rutgers College.

GOVERNING BOARD.

Board of Managers: Gov. Franklin Murphy, *Trenton;* Austin Scott, *New Brunswick;* Edward B. Voorhees, *New Brunswick;* Ephraim T. Gill, *Haddonfield;* Robert Gwynne, *Salem;* Winfield S. Bonham, *Shiloh;* John E. Darnell, *Masonville;* David D. Denise (*Pres.*), *Freehold;* James Neilson, *New Brunswick;* Samuel B. Ketcham (*V. Pres.*), *Pennington;* George Fritts, *Pattenburg;* Josiah Ketcham, *Belvidere;* James A. Burnett, *Hilton;* Abram C. Holdrum, *Westwood;* George H. Blakeley, *Paterson;* George E. DeCamp, *Roseland;* Cyrus B. Crane, *Caldwell;* George Dorer, *East Orange;* Ira C. Kilburn, *South Orange;* Rynier J. Wortendyke, *Jersey City;* Lucius F. Donohoe, *Bayonne;* John B. Williams, *New Durham;* Philip M. Brett, *Jersey City.*

STATION STAFF.

Edward B. Voorhees, D. Sc., *Dir.*
Irving S. Upson, M. A., *Chief Clerk; Sec. and Treas.*
Louis A. Voorhees, M. A., *Chief Chem.*
John P. Street, M. S., *Assoc. Chem.*
Alva T. Jordan, B. S., *Asst. Hort.*
Clarence B. Lane, B. S., *Asst. in Dairy Husb.*
Jacob G. Lipman, M. A., *Soil Chem. and Bact.*
Wm. P. Allen, B. S., *Asst. Chem.*
Mary A. Whitaker, *Sten. and Typewriter.*
Vincent J. Carberry, *Lab. Asst.*
Harry W. Williams, *Janitor.*

New Jersey Agricultural College Experiment Station, *New Brunswick.*

Department of Rutgers College.

GOVERNING BOARD.

Board of Trustees—Executive Committee: Austin Scott (*Chair.*), *New Brunswick;* Henry W. Bookstaver, *24 East 64th st., New York City;* Henry R. Baldwin, *New Brunswick;* James Neilson, *New Brunswick;* Paul Cook, *Troy, N. Y.;* Wm. H. Leupp, *New Brunswick.*

STATION STAFF.

Austin Scott, PH. D., LL. D., *President of the College.*
Edward B. Voorhees, D. Sc., *Dir.*
Julius Nelson, PH. D., *Biol.*
Byron D. Halsted, D. Sc., *Bot. and Hort.*
John B. Smith, D. Sc., *Ent.*
Wm. P. Allen, *Asst. Chem.*
James A. Kelsey, M. S., *Field Asst.*
Irving S. Upson, M. A., *Disbursing Clerk and Libr.*
Augusta E. Meske, *Sten. and Typewriter.*

LINES OF WORK.

The New Jersey State and College Stations continue to be under the supervision of the same director and to issue their publications in one series. Most of the work of these stations during the past year has been along the same lines as heretofore, including chemical studies of fertilizers and soils, feeding stuffs, and dairy products; meteorological observations; cultural experiments with orchard and small fruits, garden vegetables, ornamental plants, and lettuce and radishes under glass; an extended investigation of pear growing in the State; experiments with various forage crops, including soiling crops for dairy cows; rotation experiments with soiling crops; inoculation experiments with soy beans; experiments in feeding for milk and for fat; studies of abortion among dairy cows; observations on tuberculosis with special reference to detection, contagiousness, rapidity of development and curative action of repeated injections of tuberculin; biological studies of an intestinal disease of ducks; experiments with soil fungicides for potato and turnip diseases, including tests of the susceptibility of different varieties; studies of soil rot of sweet potatoes and club root of turnips; experiments with Nitragin and Alinit; investigations in shading; observations on the growth habits of weeds; experiments with asparagus rust and pear blight and the forcing of peaches; entomological investigations on plant lice, peach thrips, and insects injurious to orchard trees, small fruits, field crops, truck crops, and shade trees; experiments with insecticides, especially crude petroleum; extended investigations of the San José scale with special reference to distribution, remedies, and methods of application.

The last session of the State legislature appropriated $3,000 for the inspection of foods and feeding stuffs. The work was undertaken and carried out during the year by the State Station, and a bulletin containing the results of the study has been published. This appropria-

FIG. 1.—NEW JERSEY STATIONS—STALLS IN CATTLE BARN.

FIG. 2.—OREGON STATION—FRUIT EVAPORATOR.

tion has enabled the station to add a department of soil chemistry and bacteriology. For this new line of study the station has employed a special officer and is fitting up a laboratory with chemical and bacteriological apparatus. The station has erected a new silo for the study of summer silage and built an addition to the cattle barn (Pl. V, fig. 1), and the college has added to the equipment of the farm a new dairy building which will be used largely for experimental purposes. The biologist has again taken up the study of the oyster, and the entomologist is studying mosquitoes. Cooperation with this Office in irrigation investigations has been continued, and several new lines of work in cooperation with this Department have been undertaken, notably with the Bureau of Chemistry, on methods of analyzing insecticides and on the influence of environment on the sugar content of muskmelons; and with the Bureau of Soils, on soil investigation, and on various problems in making soil surveys and base maps. The inspection of fertilizers and of nurseries has been continued under State laws.

INCOME.

The income of the stations during the past fiscal year was as follows:

State station: State appropriation (fiscal year ended October 31, 1901)	$19,000
College station: United States appropriation	15,000

A report of the receipts and expenditures for the United States fund has been rendered in accordance with the schedules prescribed by this Department, and has been approved.

PUBLICATIONS.

The publications of this station received during the past fiscal year were Bulletins 144–149.

Bulletin 144, pp. 39, pls. 16, figs. 13.—Live Covers for Country Homes.—A popular treatise on the more common hardy climbing vines used in this country for ornamental purposes and shade for houses and other buildings.

Bulletin 145, pp. 52.—Analyses and Valuations of Fertilizers.—A discussion of the cost, valuation, and purchase of fertilizers, home mixtures, special fertilizers, etc., and analyses and valuations of 47 samples of standard raw materials, 300 brands of complete fertilizers, 17 samples of home and special mixtures, 25 samples of ground bone, and 31 samples of miscellaneous products.

Bulletin 146, pp. 20.—Crude Petroleum v. the San José or Pernicious Scale.—A general summary of the results of experiments with crude petroleum as an insecticide against the San José scale conducted at the station since 1897.

Bulletin 147, pp. 8, figs. 2.—The Angoumois Grain Moth.—A

description of the appearance, life history, and habits of this insect with a discussion of preventive and remedial measures.

Bulletin 148, pp. 22, pls. 4.—Alfalfa, Methods of Culture and Yields per Acre.—Alfalfa Protein v. Purchased Protein in Rations for Dairy Cows.—This bulletin notes the growing importance of alfalfa on American farms, indicates methods of culture, points out the usefulness and value of the plant, and reports a test lasting 60 days with 4 cows, comparing alfalfa hay with wheat bran and dried brewers' grains in quantities furnishing practically the same amounts of protein.

Bulletin 149, pp. 17, pls. 2.—Two Strawberry Pests.—The strawberry-leaf roller (*Phoxopteris comptana*) and the strawberry-root louse (*Aphis forbesi*) are described; notes and observations are given on their life history, habits, natural enemies, etc.; and remedial measures are discussed.

GENERAL OUTLOOK.

The New Jersey stations are painstaking in everything undertaken, and are carrying on lines of investigation that have well-defined relations to the agriculture of the State. The improvement of soils, dairying, and fruit growing are subjects of growing importance that the stations are studying. Experiments in cylinders, begun in 1898 to determine the relative availability of nitrogen in barnyard manures and in the principal nitrogenous fertilizing materials, have been very satisfactory and have given results of considerable scientific value. In the botanical department work in hybridizing has been given a prominent place. The entomologist is making an investigation of mosquitoes, and has gathered evidence which indicates that if the salt marshes near the coast were drained the number of mosquitoes would be greatly reduced. It is hoped to make a practical test of this before long. The irrigation work while not giving such decisive results as formerly, owing to climatic conditions, shows increased yields in many cases where irrigation was used. The farm is in better condition than ever before, and is used for irrigation and plat experiments and the maintenance of a herd of dairy cows. The stations have established cordial relations with the farming population of the State and are doing a large amount of useful work.

NEW MEXICO.

Agricultural Experiment Station of New Mexico, *Mesilla Park.*

Department of New Mexico College of Agriculture and Mechanic Arts.

GOVERNING BOARD.

Board of Regents: L. Bradford Prince (*Pres.*), *Santa Fe;* P. H. Curran (*Sec. and Treas.*), *Las Cruces;* G. A. Richardson, *Roswell;* H. B. Holt, *Las Cruces;* Seaman Field, *Deming.* Advisory Members: Gov. Miguel A. Otero, *Santa Fe;* J. F. Chaves (*Supt. Public Instruction*), *Santa Fe.*

STATION STAFF.

Luther Foster, M. S. A., *President of the College and Director.*

Arthur Goss, M. S., A. C., *Chem.*
John J. Vernon, M. S. Agr., *Agr.*
E. O. Wooton, M. A., *Bot.*
John D. Tinsley, B. S., *V. Dir.; Soil Phys. and Met.*
Fabian Garcia, B. S., *Hort.*
R. Fred Hare, M. S., *Asst. Chem.*
Francis E. Lester, *Registrar.*
Helen M. Macgregor, *Sten.*

LINES OF WORK.

The work of the New Mexico Station during the past year has included feeding experiments with dairy cows to test the relative value of the available feeding stuffs of the Territory; tests of the feeding value of sweet corn, cabbage, and other forage crops; tests of grasses for pasturage and for alkali lands at the station and in other localities in the Territory; variety tests and methods of sowing wheat; variety tests, acclimatization, and methods of planting corn; fertilization, winter irrigation, and methods of seeding, cutting, and curing alfalfa; green manuring and soil correctives; studies on soil moisture in cooperation with the soil physicist; irrigation experiments, including studies on pumping, storage, etc.; tests of different varieties of apples, pears, plums, prunes, peaches, grapes, strawberries, gooseberries, and currants; methods of pruning fruit trees; prevention of sunscald; production of dried prunes; spraying to retard blooming period and to prevent injury by the codling moth; test of varieties and methods of culture of vegetables; tests of the adaptability of various ornamental shrubs and flowers; chemical analyses of samples submitted by people of the Territory; analyses of sugar beets, waters, and feeding stuffs; study of the ash content of native plants and of the soils of the Territory; observations on the salt and moisture content and other physical characteristics of soil planted to corn, orchard and forest trees, and alfalfa at the station and other places in the Territory; experiments in the propagation of grasses in cooperation with the Bureau of Plant Industry of this Department; and a study of the stock-raising industry of the Territory as related to the natural forage supply.

The Territorial legislature having failed to make provision for the substations, these have been abandoned. Provision has been made, however, for the issue of 5 per cent bonds to raise $25,000 for the construction, equipment, maintenance, etc., of college buildings; for providing a larger water supply; and for paying additional officers, some of which improvements will indirectly benefit the station. During the year the work of the main station has been considerably extended, especially in the agricultural department. The farm equipment has been improved by the construction of a pumping plant and corral and the purchase of 10 head of cattle. The vice-director has been given more immediate charge of the general business of the station. At the close of the fiscal year 1900 the president of the college and director of the station resigned, and in November of the present

year Prof. Luther Foster, vice-director, agriculturist and horticulturist of the Wyoming Station, was appointed to the position.

INCOME.

The income of the station during the past fiscal year was as follows:

United States appropriation	$15,000.00
Fees	5.30
Farm products	466.51
Total	15,471.81

A report of the receipts and expenditures for the United States fund has been rendered in accordance with the schedules prescribed by this Department, and has been approved.

PUBLICATIONS.

The publications of this station received during the past fiscal year were Bulletins 32–37 and the Annual Reports for 1899 and 1900.

Bulletin 32, pp. 18.—Grasses and Forage Crops.—The importance of combining live-stock and crop interests is discussed, brief notes are given on grasses considered worthy of trial in New Mexico, and several culture and feeding experiments are reported in connection with a discussion of the following forage crops: Japanese barnyard millet, sorghum, Kafir corn, millo maize, alfalfa, and cowpeas.

Bulletin 33, pp. 17.—Notes from the San Juan Substation.—This contains a report on the successful culture of sugar beets and sorghum on alkali patches or "chico spots;" a brief account of an attempt to remove the soluble salts from an alkali spot by means of open ditches and flooding; results of rotation and fertilizer experiments with oats and corn; observations on tomato blight; brief statements concerning a practical test of the feeding value of several nonsaccharine sorghums; and notes on *Collops bipunctatus* as an enemy of the Colorado potato beetle.

Bulletin 34, pp. 54.—Principles of Water Analysis as Applied to New Mexico Waters.—This bulletin reports and discusses the results of the sanitary and mineral analyses of 148 samples of stream, spring, and well waters examined in the laboratory of the station during the past eight years.

Bulletin 35, pp. 27, figs. 10.—Observations on Insects.—Brief popular notes on a large number of injurious insects.

Bulletin 36, pp. 4.—Announcement to New Mexico Ranchmen and List of Bulletins.—Brief statements relating to the equipment and work of the station, a subject list of station publications, and the organization list of the station.

Bulletin 37, pp. 20.—Notes on the Food of Birds.—The economic relation of birds to agriculture is discussed in a general way, many special instances of the harmful or beneficial action of birds being cited, and notes are given on the feeding habits of a number of birds in New Mexico.

Annual Reports, 1899 and 1900, pp. 94.—Reports of the director and heads of departments reviewing the different lines of station work and financial statements for the fiscal years ended June 30, 1899 and 1900; also notes on the discovery of a deposit of bat guano in the Territory; list of publications of the entomologist, and reports of the superintendents of the San Juan and Las Vegas substations outlining work in progress.

GENERAL OUTLOOK.

The work of the New Mexico Station is assuming more definite form and is better planned. Its scope has been considerably extended, especially with reference to irrigation investigations and stock raising. In order to better understand the conditions of soil, water supply, timber and grazing interests of New Mexico, tours of inspection have been made to the southern and southeastern parts of the Territory. The difficulties of making satisfactory progress in studies on soil moisture and irrigation have been surmounted, it is hoped, by the construction of a windmill pumping plant with tank and storage reservoir. In this connection plans have been made for a thorough investigation of the best methods of irrigating from wells. The work of the station is better organized and in better condition than ever before, but the uncertainty regarding the head of the institution during several months of the summer and autumn, and the limited tenure of office of the men in charge of the work, has seriously interfered with its vigorous prosecution.

NEW YORK.

New York Agricultural Experiment Station, *Geneva.*

GOVERNING BOARD.

Board of Control: Stephen H. Hammond (*Pres.*), *Geneva;* W. O'Hanlon (*Sec. and Treas.*), *Geneva;* Gov. Benj. B. Odell, jr., *Albany;* A. C. Chase, *Syracuse;* F. O. Chamberlain, *Canandaigua;* F. C. Schraub, *Lowville;* Nicholas Hallock, *Queens;* Edgar G. Dusenbury, *Portville;* Oscar H. Hale, *North Stockholm;* Martin L. Allen, *Fayette.*

STATION STAFF.

W. H. Jordan, D. Sc., *Dir.*
Geo. W. Churchill, *Agr. and Supt. Labor.*
Wm. P. Wheeler, *Animal Indus.*
H. A. Harding, B. S., *Bact.*
L. A. Rogers, B. S., *Asst. in Bact.*
F. C. Stewart, M. S., *Bot.*
H. J. Eustace, B. S., *Asst. in Bot.*
L. L. Van Slyke, PH. D., *Chem.*
C. G. Jenter, PH. C., *Asst. Chem.*
W. H. Andrews, B. S., *Asst. Chem.*
J. A. Le Clerc,[a] B. S., *Asst. Chem.*
Fred B. Fuller, B. S., *Asst. Chem.*
Charles W. Mudge, B. S., *Asst. Chem.*
E. B. Hart, B. S., *Asst. Chem.*
Andrew J. Patten, B. S., *Asst. Chem.*
Geo. A. Smith, *Dairy Expert.*
Frank H. Hall, B. S., *Editor and Libr.*
Victor H. Lowe, M. S., *Ent.*
P. J. Parrott, *Asst. Ent.*
S. A. Beach, M. S., *Hort.*
N. O. Booth, B. Agr., *Asst. Hort.*
O. M. Taylor, *Foreman in Hort.*
F. E. Newton, *Clerk and Sten.*
Jennie Terwilliger, *Clerk and Sten.*
A. H. Horton, *Computer.*

[a] On leave.

LINES OF WORK.

The lines of work pursued at the New York State Station during the past year have been similar in general character and in many respects identical with those noted in previous reports. They include studies of the diseases of plants, especially treatment of asparagus rust, onion smut, and the black rot of cabbage and cauliflower; also investigations of raspberry cane blight and Rhizoctonia stem-rot diseases of various plants; entomological studies upon the life history and remedies for San José scale and tests of the effect of hydrocyanic-acid gas upon buds, flowering shrubs, and nursery stock, with other studies upon the life histories and remedies for the destructive pea louse, palmer worm, fruit-tree bark beetle, wheat sawfly, cherry fruit fly, wheat aphis, Hessian fly, and woolly aphis, and investigations upon the development of the sexual and parthenogenetic eggs of plant lice. Tests have been made of commercial fertilizers for onions; of systems of maintaining fertility, including the use of legumes, the necessity of the supply of ingredients in commercial fertilizers and comparison of commercial fertilizers and barnyard manure; foraging power of plants for phosphoric acid; nitrogen gathering power of legumes in ordinary conditions in good soil; influence of different forms of plant food upon the quality of fruit; effect of farm manures on the sugar content of sugar beets. Studies have been made on food sources of milk fat; metabolism in milch cows; influence of temperature and moisture upon loss of weight in curing cheese; influence of size of cheese upon loss of weight in curing; proteolytic changes taking place in cheese ripening under different conditions of temperature and moisture; separation and identification of proteid bodies formed in curing cheese; proteids in whey; proteolytic changes in milk inoculated with various micro-organisms; changes taking place in the production of cider vinegar; bacteriological studies and tests relating especially to cheese ripening and cheese faults; a study of enzym action of bacteria and galactase in cheese ripening.

Experiments have been conducted in poultry feeding in continuation of a series with special reference to the effect of mineral nutrients; others related to the use of bulky foods, limitations in the use of animal foods with ducklings, breeding experiments with poultry to study the effect of selection and inbreeding. Investigations have been conducted upon the self-fertility of the grape; in plant breeding, principally of grapes and small fruits; in thinning fruit; spraying in bloom; pollination of tomatoes in the forcing house; commercial fertilizers and stable manure for forcing lettuce and for apple orchards; irrigation for strawberries; propagation and culture of chestnuts; testing varieties of fruits, and in tillage *v.* mulching for strawberries.

The station has continued to cooperate with the Bureau of Chemistry

of this Department in testing sugar beets, and has arranged with the same bureau some work on dairy products. The work on rented land in different parts of the State has followed much the same lines as last year. The inspection of fertilizers, concentrated feeding stuffs and Babcock-test glassware, and the analysis of Paris green and other insecticides have been continued. The erection of a house for the director has proceeded and the building is approaching completion. The last legislature also granted an appropriation of $8,500 for repairs and alterations in fitting the present director's house and office for an administration building. The director has recently published a manual on The Feeding of Animals.

INCOME.

The income of the station during the past fiscal year was as follows:

United States appropriation	$1,500.00
State appropriation	87,119.82
Total	88,619.82

A report of the receipts and expenditures for the United States fund has been rendered in accordance with the schedules prescribed by this Department, and has been approved.

PUBLICATIONS.

The publications of this station received during the past fiscal year were Bulletins 176–196 and the Annual Report for 1899.

Bulletin 176, pp. 22.—Inspection of Concentrated Commercial Feeding Stuffs during 1900.—Text and discussion of State legislation relating to the inspection of commercial feeding stuffs, list of brands licensed, and analyses of 118 samples of feeding stuffs collected in the spring of 1900.

Bulletin 177, pp. 62.—Report of Analyses of Commercial Fertilizers for the Spring and Fall of 1900.—Contains tabulated analyses of 450 different brands of commercial fertilizers.

Bulletin 178, pp. 6.—Inspection of Babcock Milk Test Bottles.—Requirements of the New York law relative to the testing of bottles used in the Babcock test at creameries and cheese factories, with the results of inspection.

Bulletin 179, pp. 10, pls. 3.—An Anthracnose and a Stem Rot of the Cultivated Snapdragon.—These two diseases are described and illustrated and the results of spraying experiments are given.

Bulletin 180, pp. 22, pls. 8, figs. 2 (Popular edition, pp. 8, pls. 2).—Miscellaneous Notes on Injurious Insects.—Economic and biologic notes on the forest tent caterpillar, the fruit-bark beetle, a mealy bug attacking quince trees, two apple-leaf miners, and the tarnished plant bug.

Bulletin 181, pp. 6, pls. 5.—A Fumigator for Small Orchard Trees.—A description of a fumigator devised at the station, with directions for using.

Bulletin 182, pp. 30, pl. 1 (Popular edition, pp. 8).—Experiments on the Sulphur-lime Treatment for Onion Smut.—General notes on the nature and treatment of onion smut, with the detailed results of field experiments, to test the value of sulphur and lime as soil treatments, and of experiments to determine the stage of growth at which infection occurs.

Bulletin 183, pp. 22 (Popular edition, pp. 9).—Notes on Some Dairy Troubles.—Flavor in milk and its products is briefly discussed, and investigations of a fishy flavor in milk, a bitter flavor in Neufchatel cheese, a sweet flavor in Cheddar cheese, and rusty spot in Cheddar cheese are reported.

Bulletin 184, pp. 10 (Popular edition, pp. 4).—The Influence of the Temperature of Curing upon the Commercial Quality of Cheese.—Notes on the cheese industry in New York, and reports of experiments in curing cheese at temperatures common under ordinary factory conditions and at lower temperatures.

Bulletin 185, pp. 10, pls. 4 (Popular edition, pp. 4, pls. 2).—The New York Apple-tree Canker).—A second report on investigations concerning the nature of this disease due to *Sphæropsis malorum*. The occurrence of the European canker in New York is also noted.

Bulletin 186, pp. 30, pls. 2, figs. 7 (Popular edition, pp. 11, pls. 2, figs. 2).—The Sterile Fungus Rhizoctonia as a Cause of Plant Diseases in America.—This bulletin gives the results of an investigation of this subject conducted by cooperation between the two New York stations. The characters of the fungus are given and some of the more destructive of the American forms are described.

Bulletin 187, pp. 18 (Popular edition, pp. 5).—Commercial Fertilizers for Potatoes.—Results for 1899 and 1900 of fertilizer experiments with potatoes carried on for four years on Long Island farms.

Bulletin 188, pp. 44, pls. 12.—Spraying for Asparagus Rust.—A description of asparagus rust, a review of various methods of treatment which have been recommended for the control of this disease, results of spraying experiments at the station with a modified form of Bordeaux mixture, and a detailed description of an apparatus devised especially for spraying asparagus.

Bulletin 189, pp. 6, fig. 1 (Popular edition, pp. 14, pls. 3).—A Little Known Asparagus Pest.—Economic and biologic notes on the asparagus miner (*Agromyza simplex*). The popular edition summarizes this bulletin with the preceding.

Bulletin 190, pp. 8.—Report of Analyses of Paris Green and Other Insecticides in 1900.—Analyses of 22 samples of Paris green and 5 of other insecticides.

Bulletin 191, pp. 42, pls. 5, map 1 (Popular edition, pp. 11, pls. 3.—A Fruit Disease Survey of Western New York in 1900.—Notes on different diseases of orchard and small fruits occurring in 18 counties in the western part of New York, the data being obtained from personal observations and from replies to circulars of inquiry sent to fruit growers.

Bulletin 192, pp. 18, pls. 6.—The Substitution of Soda for Potash in Plant Growth.—The results of previous investigations on this subject are briefly reviewed and an account is given of pot experiments carried on in a forcing house at the station during two winters.

Bulletin 193, pp. 18, pls. 6.—San José Scale Investigations. I, The Development of the Female.—Investigations here reported included experiments to determine the duration of the period of activity, rate of travel and mortality of larvæ, duration of the period of growth, and the effect of temperature on the development of larvæ. The different stages in the life history of the insect and means of distribution and control were studied.

Bulletin 194, pp. 16 (Popular edition, pp. 11, pls. 2).—San José Scale Investigations. II, Spraying Experiments with Kerosene Oil; Methods of Combating the San José Scale.—Experiments reported in detail in this bulletin were undertaken for the purpose of determining the effects of winter applications of kerosene oil on nursery trees and bearing trees, the percentage of oil necessary to kill scales in winter, and the effect of summer application on healthy trees. Brief notes are also given on the method of fumigation by hydrocyanic-acid gas and spraying with crude petroleum and whale-oil soap. The popular edition summarizes this bulletin with the preceding.

Bulletin 195, pp. 14.—Director's Report for 1900.—A review of the different lines of station work with results obtained, including also notes on the station staff, institute and inspection work, cooperative experiments, etc., and a subject list of bulletins published in 1900.

Bulletin 196, pp. 62, pls. 3, figs. 6 (Popular edition, pp. 15, pl. 1, figs. 5).—Spraying in Bloom.—Extensive field experiments as regards the effect of spraying fruit trees when in full bloom upon the yield conducted at the Cornell Station and at the State Station are reported, as is also a laboratory study of the effect of spray mixtures upon the germination of pollen and the growth of pollen tubes made at the State Station. Observations made at the State Station on the effect of spray mixtures on individual blossoms are reported and a description is given of the structure of an apple blossom and the process of setting fruit.

Annual Report, 1899, pp. 503, pls. 35.—This contains the organization list of the station, a financial statement for the year ended September 30, 1899, a meteorological record, and reprints of Bulletins 158–173 of the station.

GENERAL OUTLOOK.

This station has confined its investigations to lines of work closely connected with a few of the leading industries of the State. These are dairying, including cheese making; fruit raising, especially grapes; poultry raising; and plant production, including both field crops and garden vegetables, with closely related investigations on insects and diseases affecting fruits and plants. The work is well planned and carefully carried out and much of it is productive of valuable results. Farmers' institute work by station officers has been continued upon a satisfactory basis, which disseminates information regarding the work of the station throughout the State, and yet does not interfere materially with the regular work of inspection and investigation.

Cornell University Agricultural Experiment Station, *Ithaca.*

Department of Cornell University.

GOVERNING BOARD.

Board of Trustees—Station Council: Jacob G. Schurman (*Pres.*); Isaac P. Roberts, Franklin C. Cornell, John H. Comstock, Liberty H. Bailey, Emmons L. Williams.

STATION STAFF.

Jacob G. Schurman, B. A., D. Sc., LL. D., *President of the University.*
Isaac P. Roberts, M. Agr., *Dir.; Agr.*
George C. Caldwell, B. S., Ph. D., *Chem.*
James Law, F. R. C. V. S., *Vet.*
John H. Comstock, B. S., *Ent.*
Liberty H. Bailey, M. S., *Hort.*
Henry H. Wing, B. Agr., M. S., *Dairy Husb. and Animal Indus.*
G. F. Atkinson, M. S., *Cryptogamic Bot.*
Mark V. Slingerland, B. S., *Asst. Ent.*
Louis A. Clinton, B. S., *Asst. Agr.*
J. L. Stone, B. S. A., *Asst. in Agr.*
George W. Cavanaugh, B. S., *Asst. Chem.*
Clayton O. Smith, B. S., *Asst. in Cryptogamic Bot.*
O. F. Hunziker, B. S. A., M. S. A., *Dairy Bact.*
John Craig, B. S., *Extension Work in Agr. and Hort.*
Jas. A. Foord, B. S. A., *Asst. in Dairy Husb.*
Chas. E. Hunn, *Gardener.*
E. L. Williams, *Treas.*
E. A. Butler, *Clerk.*

LINES OF WORK.

The work of the New York Cornell Station during the past year has followed practically the same lines as in previous years, including variety experiments with wheat and sugar beets; comparisons of different legumes as soil renovators; experiments with commercial fertilizers on pastures; tillage and spraying experiments with potatoes; fertilizer and variety tests of buckwheat; tests of various plants as forage crops; plat experiments with grasses; feeding experiments with steers, pigs, and dairy cows; dairy investigations, including cheese making; breeding and feeding experiments with poultry; studies of the higher fungi, especially those of use as food plants; investigations of the fungus diseases causing decay of forest trees and shade trees;

spraying experiments; investigations of diseases of plants, including crown blight, root rot, and a disease of hops; studies in cooperation with the botanist at the Geneva Station on the sterile fungus Rhizoctonia as a cause of plant diseases in the State; chemical studies of soils, fertilizers, beets and their by-products in beet-sugar manufacture, ashes, butter colors, insecticides, and feeding stuffs; investigations on the life history of the palmer worm, peach borer, greenhouse leaf tier, strawberry pests, a grape pest new to the State, and a new beneficial insect, the common European praying mantis; and horticultural work, including studies of Japanese plums, the forcing of strawberries, tree fruits, and mushrooms, and investigations of methods of spraying.

The station continues to carry on an extensive system of cooperative experiments throughout the State with the aid of State funds. These experiments for the last year have been along six principal lines—renovation of apple orchards, trial of orchard cover crops, spraying of fruit trees when in blossom, culture of cabbage, garden beans, and muskmelons in western New York. The experience of five years in this work has demonstrated, among other things, that the apple orchard in New York State, when well cared for, is valuable property; that cover crops are effectual in maintaining orchard fertility, and that it is not wise to spray fruit trees during the blossoming period. During the year the horticulturist has published a book on the Principles of Vegetable Gardening and three volumes of his Cyclopedia of American Horticulture.

INCOME.

The income of the station during the past fiscal year was as follows:

United States appropriation	$13,500.00
State appropriation	[a]12,131.69
Farm products, including balance from previous year	397.87
Total	26,029.56

A report of the receipts and expenditures for the United States fund has been rendered in accordance with the schedules prescribed by this Department, and has been approved.

PUBLICATIONS.

The publications of this station received during the past fiscal year were Bulletins 183–192 and the Annual Report for 1900.

Bulletin 183, pp. 16, dgms. 2.—Sugar-beet Pulp as a Food for Cows.—A description and an analysis of sugar-beet pulp and the results of two feeding experiments with 11 cows.

[a] This is approximately the amount spent for experimental purposes out of an appropriation of $35,000 by the State for cooperative experiments and university extension work in agriculture.

Bulletin 184, pp. 16, pls. 3, figs. 4.—The Grape Root-worm, a New Grape Pest in New York.—Brief popular notes on the life history, habits, treatment, etc., of *Fidia viticida* reported as injurious to grapes.

Bulletin 185, pp. 16, pl. 1, figs. 2.—The Common European Praying Mantis, a New Beneficial Insect in America.—The occurrence of this insect in the State is noted and a brief account is given of its habits, life history, etc.

Bulletin 186, pp. 28, pls. 2, figs. 7.—The Sterile Fungus Rhizoctonia as a Cause of Plant Diseases in America.—This bulletin gives the results of an investigation of this subject conducted by cooperation between the two New York stations. The characters of the fungus are given and some of the more destructive of the American forms are described.

Bulletin 187, pp. 28, pls. 2, figs. 4.—The Palmer Worm.—An account of *Ypsolophus pometellus* as regards history, appearance at different stages, distribution, food plants, life history, natural enemies, remedial measures, etc., with a bibliography of the literature relating to this species.

Bulletin 188, pp. 12.—Spray Calendar.—Formulas and directions for preparation are given for the more important fungicides and insecticides.

Bulletin 189, pp. 24, pl. 1, figs. 2.—Oswego Strawberries.—Cooperative fertilizer experiments with strawberries carried on by the station and growers in Oswego for a period of three years are reported, methods of strawberry culture followed by Oswego growers are briefly outlined, and a short history is given of the development of the industry in Oswego, including some statistics of shipments to the larger markets in different years.

Bulletin 190, pp. 24, pls. 6, figs. 4.—Three Unusual Strawberry Pests and a Greenhouse Pest.—Descriptive and remedial notes based on observations and experiments at the station are given on *Cacœcia obsoletana*, two species of ground beetles (*Harpalus caliginosus* and *H. pennsylvanicus*), the white fly of the strawberry belonging to the genus Aleurodes, and the greenhouse leaf tier (*Phlyctænia rubigalis*).

Bulletin 191, pp. 24, fig. 1.—Tillage Experiments with Potatoes.—The results of cooperative culture experiments with potatoes, including early or twice plowing, thorough fitting, deep planting, and level tillage conducted in 1899 and 1900 are summarized.

Bulletin 192, pp. 8, figs. 5.—Further Experiments Against the Peach-tree Borer.—Further tests of wire-cage protectors for keeping the peach-tree borer away from peach trees, wooden wrappers, and the gas-tar treatment are reported.

Annual Report, 1900, pp. 589, pls. 16, figs. 149, maps 2, dgms. 7.—The report proper includes the organization list of the station and brief reports on the work and expenditures of the station by the director,

treasurer, and heads of departments. Appendix I is made up of reprints of Bulletins 171–182 of the station. Appendix II gives a detailed statement of receipts and expenditures of the station for the fiscal year ended June 30, 1900. Appendix III contains reprints of publications on nature study.

GENERAL OUTLOOK.

Many of the important crops of the State are being studied by the station, especially from the point of view of field practice, as best suited to the different sections of the State, and special attention is being given to bringing the results of experimental work home to the farmer through the extensive system of cooperative experiments rendered possible by the State appropriation. The college with which the station is connected continues to be active in university-extension work in agriculture and in the effort to introduce nature study in the rural schools. The publication of the Nature Study Quarterly has been suspended, but the Junior Naturalist Monthly and the Reading Lessons for Farmers have been continued, and the publication of Reading Lessons for Farmers' Wives has been started. Both the cooperative experiments and the university-extension work have aided in bringing about the most cordial relations between the station and the people of the State, and this condition has been very helpful to the station, not only in facilitating the dissemination of information but also in furnishing an easy and reliable means of learning what the station can do for the farmer along investigational lines.

NORTH CAROLINA.

North Carolina Agricultural Experiment Station, *West Raleigh.*

Department of North Carolina College of Agriculture and Mechanic Arts.

GOVERNING BOARD.

Board of Agriculture: J. B. Coffield, *Everetts;* E. L. Daughtridge, *Rockymount;* William Dunn, *Newbern;* C. N. Allen, *Auburn;* J. S. Cunningham, *Cunningham;* A. T. McCallum, *Red Springs;* J. P. McRae, *Laurinburg;* L. G. Waugh, *Dobson;* W. A. Graham, *Machpelah;* A. Cannon, *Horseshoe;* J. R. Joyce, *Reidsville;* G. E. Flow, *Monroe;* J. C. Ray, *Boone;* Howard Browning, *Littleton.*

STATION STAFF.

George T. Winston, LL. D., *President of the College.*

B. W. Kilgore, M. S., *Dir.*
W. A. Withers, M. A., *Chem.*
C. W. Burkett, M. S., PH. D., *Agr.*
W. F. Massey, C. E., *Hort.*
F. L. Stevens, PH. D., *Bot.*
Franklin Sherman, jr., *Ent.*
Tait Butler, V. S., *Vet. and Animal Indus.*
G. S. Fraps, PH. D., *Asst. Chem.*
H. P. Richardson, *Poultryman.*
B. S. Skinner, *Farm Supt.*
B. F. Walton, *Supt. Agr. Expt. Works.*
Mrs. E. V. Darby, *Sten.*

A. F. Bowen, *Bursar.*

LINES OF WORK.

The work of the North Carolina Station during the past year has included sugar-beet investigations in cooperation with the Bureau of Chemistry of this Department; studies on the availability of nitrogen in different forms, the effect of composting on plant food, and the minimum food requirements of corn, cotton, sweet potatoes, and a renovating crop; studies in animal nutrition, including determinations of the digestibility of various feeding stuffs and of the composition of cotton-seed meal; investigations on the determination of pentosoids; chemical work on ash analysis in cooperation with the Association of Official Agricultural Chemists of the United States and the Bureau of Chemistry of this Department; orchard work; experiments in the production of bulbs and roses for the Northern trade; studies of edible and poisonous mushrooms; studies and identification of fungus and bacterial diseases of cultivated crops, especially anthracnose on dewberries and a disease of summer cabbages known as "yellowsides;" entomological work; duplicate plat experiments with forage crops, cotton, peas, and soy beans on both old and new land to determine how best to restore lost fertility and how to conserve virgin fertility; fertilizer, cultural, and variety experiments with the principal farm crops; variety tests with grasses and sweet potatoes and experiments in the hybridization of orange trees in cooperation with the Bureau of Plant Industry of this Department. The station is cooperating with farmers in experiments with corn, cotton, and rice, and has undertaken cooperative experiments with the Bureau of Chemistry of this Department on the influence of environment on the sugar content of muskmelons. In cooperation with both the Bureau of Soils of this Department and the State department of agriculture, the station is conducting a soil survey to ascertain the definite location and extent of the type soil areas of the State.

During the year the station has been reorganized. The State legislature at its last session put both the college and station under control of the State board of agriculture. The president of the college retired from the directorship of the station and in accordance with his suggestion, B. W. Kilgore, chemist in charge of the State fertilizer inspection under the board of agriculture, was made director. The latter, however, will retain charge of the inspection. The agriculturist resigned and was succeeded by Dr. C. W. Burkett, of New Hampshire. The station staff was also materially strengthened by the appointment of a veterinarian in charge of animal husbandry, a botanist, and a poultryman.

INCOME.

The income of the station during the past fiscal year was as follows:

United States appropriation	$15,000.00
Farm products	434.01
Miscellaneous	262.38
Total	15,696.39

A report of the receipts and expenditures for the United States fund has been rendered in accordance with the schedules prescribed by this Department, and has been approved.

PUBLICATIONS.

The publications of this station received during the past fiscal year were Bulletins 171–178 and the Annual Report for 1900.

Bulletin 171, pp. 20.—Corn Culture in North Carolina.—This is a popular bulletin on corn culture, dealing in detail with the following subjects: Kinds of land suited for corn culture, preparation of the soil, planting, fertilizing, cultivation, rotations for corn, varieties best adapted to the South, harvesting the crop, selection and improvement of seed, protection against weevils and moths, and the comparative food value of corn and other forage crops.

Bulletin 172, pp. 36.—The Digestibility of Some Nonnitrogenous Constituents of Certain Feeding Stuffs.—The Purification of Phloroglucinol.—From data obtained in digestion experiments with sheep the digestibility of several nonnitrogenous constituents of feeding stuffs is estimated, the methods followed are described, and the work is discussed in relation to similar work elsewhere. A method for preparing phloroglucin free from diresorcin for use in the determination of pentosans is given.

Bulletin 173, pp. 12.—Another Warning in Regard to Compost Peddlers.—Defects in two fertilizer formulas offered for sale in the State are pointed out, farmers are cautioned against buying such formulas, and publications relating to fertilizers are recommended.

Bulletin 174, pp. 12.—Methods of Determining Proteid Nitrogen in Vegetable Materials.—A study of phospho-tungstic acid and bromin as precipitants for the proteids of vegetable materials is reported.

Bulletin 175, pp. 12.—Some New Species of the Genus Cratægus and Notes on Some Dichotomous Panicums.—Descriptions of 21 new species of Cratægus and 7 new species of Panicum.

Bulletin 176, pp. 10.—The Relative Value of Some Nitrogenous Fertilizers.—Experimental work at the station on the relative rate of nitrification of different fertilizers is reported and discussed in connection with a review of studies of the rate of nitrification of fertilizers and of the availability of nitrogenous fertilizers made elsewhere.

Bulletin 177, pp. 136.—Edible Mushrooms of North Carolina.—Notes are given on the food value of mushrooms, directions for their collection are given, and a number of the more important mushrooms occurring in the State are described.

Bulletin 178, pp. 16.—The Nature of Pentosoids and their Determination.—A summary of existing knowledge relating to pentosoids and a report of investigations concerning their properties and determination.

Annual Report, 1900, pp. 134.—This includes a report of the director on the work and publications of the station during the year; reports of the agriculturist, chemist, and the horticulturist, botanist, and entomologist, giving detailed outlines of the work of their respective departments; a financial statement for the fiscal year ended June 30, 1900, and reprints of Bulletins 170–174 of the station.

GENERAL OUTLOOK.

While devoting much attention to the farm crops now grown as staples in the State, the North Carolina Station is directing a greater effort than before to the improvement of the soil and the development of new industries. Information gathered from experiments with sugar beets has been compiled for publication. It shows that at least three, and probably thirteen, counties in the western part of the State are well adapted to the production of sugar beets, and that water, lime, and coal are available for the manufacture of sugar. Experiments during the past year with 15,000 rose cuttings from a Northern dealer indicate that the production of roses for the Northern trade can be made a profitable business. The production of flowering bulbs and early vegetables and fruits for the Northern trade is also receiving attention. The station is extending its influence by means of press bulletins and an extensive correspondence, and is establishing closer relations with leading farmers by means of cooperative experiments. The separation of the offices of president of the college and director of the station was a move in the right direction, as was also the bringing together of all experimental work under one management. For a number of years the State department of agriculture has been conducting a soil survey and experimental work in connection with its inspection work, and has established several experimental farms in different parts of the State. All of this work has now been combined with the station work under Director Kilgore and this, together with the anticipated strengthening of the station through funds obtained under the fertilizer law, makes the outlook for this station very promising.

NORTH DAKOTA.

North Dakota Agricultural Experiment Station, *Agricultural College.*[a]

Department of North Dakota Agricultural College.

GOVERNING BOARD.

Board of Trustees: W. H. Robinson (*Pres.*), *Mayville;* B. N. Stone, *Lamoure;* John W. von Nieda (*Treas.*), *Fargo;* Henry J. Rusch (*Sec.*), *Fargo;* S. S. Lyon, *Fargo;* Alex. Stern, *Fargo;* Maynard Crane, *Cooperstown;* George E. Osgood, *Fargo.*

[a] Freight and express address, Fargo.

STATION STAFF.

J. H. Worst, LL. D., *President of the College and Director.*
E. F. Ladd, B. S., *Chem.* H. L. Bolley, M. S., *Bot.*
J. H. Shepperd, M. S. A., *Agr.* A. M. Ten Eyck, M. S., *Asst. Agr.*
C. B. Waldron, B. S., *Hort.* H. M. Ash, *Farm Supt.*
C. E. Nugent, *Bookkeeper and Accountant.*

LINES OF WORK.

The work of the North Dakota Station during the past year has been along the same lines as heretofore and has included studies of the transformation of vegetable matter into humus and the formation and movements of nitrates in the soil, with accompanying studies of nitrifying bacteria; experiments to determine the loss of nitrates from leaching and to determine the amount of water required to produce 1 pound of dry matter in soils containing an abundant supply of plant food; a comparative study of timothy and brome grass for hay and pasture; selection experiments with corn and wheat to secure varieties with higher gluten content; also selection experiments with potatoes and flax; studies of plant diseases, especially flax wilt; plant breeding; rotation experiments; feeding experiments with horses and pigs, the latter for the utilization of waste products; horticultural investigations, including the cultivation of vegetables, small fruits, and apples, and experiments with forest trees, shelter belts, hedges, etc. Some work on the conservation of moisture and on varieties of grasses to bind the soil has been conducted at a substation at Edgely, with the aid of a small appropriation from the State. In connection with poultry work an egg record is being kept with a view to learning how to produce fertile eggs. Studies on the conservation of soil moisture are being made by cultivation and rotation and by the determination of the amount of moisture which a crop takes out and leaves in the soil.

During the year the station has furnished sugar-beet seed to about 1,600 farmers for cooperative work. Cooperation with the Bureau of Plant Industry of this Department includes experiments to determine the influence of the origin of red-clover seed on yield of crop and to improve the wheat industry of the Northwest. Further investigation of the so-called "flax sickness" has convinced the botanist that it is identical with the newly described disease known as "flax wilt," and is due to a fungus belonging to the genus Fusarium, which is rapidly distributed to new soils by means of seed flax, straw, manure, etc. Many experiments have been conducted to determine the various features in the life history of the fungus and some means of preventing its occurrence in the crop. Members of the station staff rendered assistance at a large number of farmers' institutes during the fall and winter. A farmers' institute law, which became effective July 1, 1901, carries an appropriation of $2,500 for two years and connects this

enterprise with the college. The excursions of farmers to the college have brought some 7,000 farmers to visit the institution during the past summer.

January 4, 1901, the large general-purpose barn was burned. This has been replaced by the erection of two barns at a total cost of $18,000. The college with which the station is connected has been given $50,000 for the erection of buildings, and has had its maintenance fund materially increased by the enactment of a law giving it a tax of one-fifth mill on each dollar of taxable property in the State.

INCOME.

The income of the station during the past fiscal year was as follows:

United States appropriation	$15,000.00
Farm products	1,317.04
Miscellaneous	598.00
Total	16,915.04

A report of the receipts and expenditures for the United States fund has been rendered in accordance with the schedules prescribed by this Department, and has been approved.

PUBLICATIONS.

The publications of this station received during the past fiscal year were Bulletins 44–46 and the Annual Report for 1900.

Bulletin 44, pp. 14, fig. 1.—Water Hemlock Poisoning.—Preserving Eggs.—A case of poisoning of two cows by water hemlock is reported and notes are given on the preservation of eggs with water glass. The bulletin is largely reprinted from an earlier publication of the station.

Bulletin 45, pp. 14.—Feeding Trials with Work Horses.—Results of feeding experiments with horses and mules in which timothy hay was compared with brome grass hay and with oat straw, and oats were compared with barley, malted barley, malted barley and bran, corn, and with bran and shorts.

Bulletin 46, pp. 94.—A Preliminary List of the Spermaphyta, Seed-bearing Plants of North Dakota.—A list with notes of the seed-bearing plants of the State, in which 340 genera and 775 species and varieties are enumerated.

Annual Report, 1900, pp. 119.—This includes a brief report on station work by the director; a financial statement for the fiscal year ended June 30, 1900; and departmental reports containing determinations of the nitrogen content of wheat, summaries of meteorological observations for 1900, notes on cooperative culture experiments with

sugar beets with tabulated analyses of a large number of samples, miscellaneous analyses, an account of work in the improvement of wheat by seed selection, investigations on the stinking smut of wheat relating especially to the effect of soil and weather conditions on the spores, the influence of smut in bread making, and treating the seed with formaldehyde and planting at different depths, a report of work in the selection of potatoes for seed with notes on experiments to determine the possibility of root fusion, studies relating to the uneven ripening of flax, a preliminary report of observations on a disease of flax designated as "flax wilt," results of experiments in the destruction of weeds by spraying, observations on the growth of weed seeds planted at different depths, details and results of tests including in some cases culture experiments of 63 varieties of wheat, 25 of oats, 25 of barley, 4 of spelt, 13 of millet, 4 of flax, 6 of buckwheat, 40 of potatoes, and 5 of beans, and tabulated results of experiments with wheat, corn, oats, barley, spelt, and flax to determine the effect of age and length of sprouts upon the vitality of seeds.

GENERAL OUTLOOK.

The work of the North Dakota Station has been directed mainly to the introduction of improved methods of farming and the development, acclimatization, and distribution of hardy varieties of cereals, forage plants, and fruits suited to the climate of the State. Considerable effort has been made to demonstrate the value of crop rotations, improved methods of cultivation, and stock raising in this region of frequent severe droughts. Much attention also has been given to breeding and selecting wheat, corn, fruits, and garden vegetables. One result has been the acclimatization of several varieties of dent corn and the extension of the successful cultivation of corn northward. Experiments with sugar beets during the past ten years have shown that the southern part of the State at least is adapted to the successful production of sugar, and efforts are now being made to determine the fitness of the soil and climate for the production of peas, beans, corn, and tomatoes for canning. The work of the station is meeting the approval of the farmers and they are coming to it in increasing numbers for advice and assistance.

OHIO.

Ohio Agricultural Experiment Station, *Wooster.*

GOVERNING BOARD.

Board of Control: Alva Agee (*Pres.*), *Cheshire;* F. Whittlesey, *Atwater;* D. D. White, *Castalia;* O. E. Bradfute (*Sec.*), *Cedarville;* D. L. Sampson (*Treas.*), *Cincinnati.*

STATION STAFF.

C. E. Thorne, M. S. A., *Dir.*
W. J. Green, *V. Dir.; Hort.*
J. F. Hickman, M. S. A., *Agr.*
F. M. Webster, M. S., *Ent.*
A. D. Selby, B. S., *Bot. and Chem.*
P. A. Hinman, *Bursar.*
John W. Ames, B. S., *Asst. Chem.*
John F. Hicks, *Asst. Bot.*
Wilmon Newell, M. S., *Asst. Ent.*
Clarence W. Waid, B. S., *Asst. Hort.*
J. C. Burneson, V. S., *Vet.*
William Holmes, *Foreman Farm.*
C. A. Patton, *Asst. Foreman and Met.*
Annie B. Ayres, *Mailing Clerk.*
Cary Welty, *Mechanic.*
Edward Mohn, *Supt. Substa.* (*Strongsville*).
Lewis Schultz, *Supt. Substa.* (*Swanton*).

LINES OF WORK.

The work of the Ohio Station during the past year has consisted principally in a continuation of investigations begun in former years, and has included investigations on the physical and chemical composition of soils and the conservation of moisture and fertility; variety and cultural experiments with field and garden crops, together with observations on the growth habits of different species; diseases of plants; entomology; comparison of different breeds of cattle and sheep; feeding experiments, with some investigations on the nutrition of animals and studies of the diseases of animals. The station continues to cooperate with this Department in work on sugar beets and tuberculosis. Studies of problems in the maintenance of soil fertility are conducted on a large scale in five different parts of the State. The horticulturist has been giving special attention to experiments in mulching, irrigation of field plats with pipes, and subirrigation in the greenhouse. The entomologist has made a comprehensive study of the use of kerosene as a spray, and has also paid considerable attention to the use of the Sporotrichum fungus for destroying the chinch bug.

Under a special appropriation made by the State legislature the station has conducted an investigation on the prevalence of bovine tuberculosis throughout the State, the results of which indicate that while a majority of the cattle of the State are free from this disease, yet it exists in many herds. The tuberculin for this investigation is furnished by the Bureau of Animal Industry of this Department. A late rot of the grape, possibly the white rot, has wrought great destruction to the grape industry of the lake region in Ohio. The station carried on experiments in that region during the past summer which resulted in saving 97 per cent of the grapes in vineyards treated, whereas in untreated vineyards the crop was practically all destroyed. The orchards planted by the station upon its removal to Wooster are now coming into bearing, and the station made an exhibit of fruits from these orchards at the last State fair. The inspection of nurseries and orchards, in charge of the entomologist, has been continued with a State appropriation of $15,000 for the years 1900 and 1901. The substations at Strongsville and Swanton have been continued at State expense.

INCOME.

The income of the station during the past fiscal year was as follows:

United States appropriation	$15,000.00
Farm products	1,317.04
Miscellaneous	598.00
Total	16,915.04

A report of the receipts and expenditures for the United States fund has been rendered in accordance with the schedules prescribed by this Department, and has been approved.

PUBLICATIONS.

The publications of this station received during the past fiscal year were Bulletins 112–126 and the Annual Report for 1900.

Bulletin 112, pp. 8, pl. 1, map 1.—The Clover-root Borer.—Descriptive and remedial notes on *Hylastes obscurus*, with the results of an experiment in plowing immediately after harvesting the first crop of clover for the destruction of this insect.

Bulletin 113, pp. 14, pls. 6.—Plums—A Comparison of Varieties.—Descriptive notes are given on the 175 varieties of plums which have been tested at the station. The varieties are classified into groups and the groups characterized.

Bulletin 114, pp. 10, pls. 2, fig. 1.—How Insects are Studied at the Ohio Agricultural Experiment Station.—A popular account of the insectary and breeding cages at the station, and of methods of collecting, rearing, preserving, and labeling insects.

Bulletin 115, pp. 20.—Sugar Beet and Sorghum Investigations in 1899.—Results of cooperative culture experiments with sugar beets in 1899, including tabulated analyses of 131 samples; and of cooperative experiments with sorghum, in which seed of 5 varieties was distributed to 122 farmers in 54 counties of the State for the purpose of comparing varieties and securing seed for future crops.

Bulletin 116, pp. 4, pl. 1.—The Grape-cane Gall Maker and its Enemies.—Observations on the life history and natural enemies of this insect, with suggestions as to preventive measures.

Bulletin 117, pp. 14, pl. 1.—Stomach Worms in Sheep.—A description of a stomach worm (*Strongylus contortus*) causing serious losses of sheep in Ohio since 1896, and an account of experiments to test the benzine or gasoline treatment for this worm and to determine the method of infection.

Bulletin 118, pp. 26.—Field Experiments with Wheat.—Detailed data for 1899 of variety tests and various culture experiments with wheat and average results each year from 1893 to 1899.

Bulletin 119, pp. 10, map 1.—The Hessian Fly in 1899 and 1900.—Notes on the damage done by the Hessian fly in Ohio during the fall of 1899 and the spring of 1900, and on the influence of meteorological

conditions on the development of this insect, with suggestions for growing wheat so as to lessen the danger from this source.

Bulletin 120, pp. 32.—Meteorological Summary.—Press Bulletins.—A summary of meteorological observations during 1899 and for comparison similar data for previous years; and reprints of the press bulletins issued during the year which have not already been incorporated in the regular bulletins.

Bulletin 121, pp. 70, figs. 54.—A Condensed Handbook of the Diseases of Cultivated Plants in Ohio.—Includes a popular discussion of some of the causes of plant diseases and the means by which they are spread, descriptions of the more common diseases observed as occurring in Ohio, directions for the preparation and use of fungicides and insecticides, and a spray calendar.

Bulletin 122, pp. 14, pl. 1, figs. 2.—Onion Smut—Preliminary Experiments.—A preliminary account is given of experiments conducted for the prevention of onion smut, together with notes on the onion-smut fungus and its distribution and manner of infection, and general suggestions for the treatment of this disease.

Bulletin 123, pp. 18, pl. 1.—Grape Rots in Ohio.—Experiments in the Prevention of Grape Rot.—An account is given of the various grape diseases, especial attention being paid to the black rot and the white rot, and spraying experiments with Bordeaux mixture, formalin, salicylic acid and lime, salicylate of soda, and copper sulphate for the prevention of grape rot are reported.

Bulletin 124, pp. 18.—The Maintenance of Fertility.—Details and results of a large number of field experiments with a variety of fertilizers. The work is in continuation of investigations on the maintenance of fertility reported upon in earlier publications of the station.

Bulletin 125, pp. 12.—The Maintenance of Fertility.—Experiments similar to those noted above, comparing superphosphate, muriate of potash, nitrate of soda, and dried blood applied in different amounts and combinations for potatoes, are reported. A rotation for potatoes was studied in this connection.

Bulletin 126, pp. 42, pls. 5, fig. 1.—Sugar-beet Investigations in Ohio in 1900.—A report on cooperative culture tests with sugar beets throughout the State, including the results of germination tests of the beet seed used, meteorological data for the year and for previous seasons, a discussion of the beet-sugar industry in Ohio, a description of the beet-sugar factory, and notes on sugar-beet culture and on the more important diseases of sugar beets.

Annual Report, 1900, pp. 29.—This contains the organization list of the station; a financial statement for the fiscal year ended June 30, 1900; a report of the director reviewing the work of the station during the year, discussing the relation of the station to the agriculture of the State, and giving a list of acknowledgments, and the text of the orchard and nursery inspection law.

GENERAL OUTLOOK.

The Ohio Station continues to devote considerable effort to the solution of problems in the maintenance of soil fertility, and the result of applying different fertilizers during the past year has shown striking contrasts. It has been shown that barnyard manure taken fresh from the stalls and applied to corn is worth about 50 cents more per ton than that which has lain in a level open yard during the winter. The addition of gypsum or kainit to the manure a few weeks before its application increases its effectiveness, and still greater effectiveness is produced by the addition of acid phosphate and of finely ground unacidulated rock known as "floats." Of greater importance is the fact that the yield from the use of unacidulated floats is quite as large as that from an equal weight of acid phosphate, thus indicating the possibility of dispensing with the acidulation of phosphate rock, providing it be finely ground and used in connection with barnyard manure. The feeding experiments at the station have been brought to a point where the results of several years' comparative study of different breeds of cattle may be compiled for publication.

The work of the Ohio Station has been organized upon a plan which contemplates a long series of investigations upon a few principal lines of research, hence the importance of the results attained from year to year depends largely upon the result of the whole series of investigations. The inspection of nurseries under a State law has been organized separately from the general business of the station, and has proved a task of much greater magnitude than was anticipated. Difficulties in the administration of this station have of late been a serious hindrance to its work. The duties of the director should be more clearly defined, and he should be made fully responsible for the direct management of the station, subject to the general policy established by the board of control.

OKLAHOMA.

Oklahoma Agricultural Experiment Station, *Stillwater.*

Department of Oklahoma Agricultural and Mechanical College.

GOVERNING BOARD.

Board of Regents: F. J. Wikoff (*Pres.*), *Stillwater;* Gov. T. B. Ferguson, *Guthrie;* H. G. Beard, *Shawnee;* T. J. Hartman (*Treas.*), *Deer Creek;* H. C. R. Brodboll, *Ponca;* W. H. Merten, *Guthrie.*

STATION STAFF.

Angelo C. Scott, M. A., LL. M., *President of the College.*
John Fields, B. S., *Dir.; Chem.*
L. L. Lewis, M. S., D. V. M., *Vet.*
F. C. Burtis, M. S., *Agr.*
W. R. Shaw, PH. D., *Bot. and Ent.*
Oscar M. Morris, B. S., *Assoc. Hort.*
A. B. McReynolds, B. S., *Asst. Chem.*
J. S. Malone, B. S., *Asst. Agr.*
H. M. Hand, *Clerk.*
Miss G. M. Holt, *Sten.*

LINES OF WORK.

The work of the Oklahoma Station during the past year included the continuation of investigations begun in previous years and the beginning of some new lines of work. Digestion experiments with Kafir corn and its products were continued, as were also determinations of the yield of digestible nutrients by a number of fodder crops; feeding experiments with steers and pigs; studies of methods of wintering and summering yearling steers; cultural and variety experiments with wheat; experiments in pasturing wheat; experiments in continuous cropping of wheat and Kafir corn; three-year and five-year rotation experiments with and without manuring; fertilizer and culture experiments with alfalfa; studies of the flora of the Territories; studies of the crown knot of the apple, and of a destructive root rot of fruit trees; forestry experiments in cooperation with the Bureau of Forestry of this Department; horticultural investigations, especially with orchard and small fruits, and variety and cultural experiments with potatoes. Experiments with chickens under average farm conditions were continued and similar experiments with ducks begun, and to the investigations on blackleg, Texas fever, and animal parasites have been added investigations on hog cholera, swine plague, and contagious abortion. Experiments have been begun in the improvement of castor beans by selection and in the improvement of native grass pastures by introducing new grasses. The legislature at its last session appropriated $54,000 for college and station buildings. These will include a new barn for the joint use of college and station, and a college building which will furnish better quarters for the station departments of botany and entomology.

INCOME.

The income of the station during the past fiscal year was as follows:

United States appropriation	$15,000.00
Farm products, including balance from previous year	2,924.84
Total	17,924.84

A report of the receipts and expenditures for the United States fund has been rendered in accordance with the schedules prescribed by this Department, and has been approved.

PUBLICATIONS.

The publications of this station received during the past fiscal year were Bulletins 46–50 and the Annual Report for 1900.

Bulletin 46, pp. 8.—Digestion Trials.—Results of experiments with chickens to test the digestibility of corn, Kafir corn, and cowpeas; and of experiments with sheep to test the digestibility of corn, Kafir corn, sorghum, black-rice corn, and millo maize.

Bulletin 47, pp 48.—Reports of Wheat Raisers.—Experiments with Wheat.—Summaries of replies from 118 farmers to circulars of inquiry sent out by the station requesting information regarding wheat farming in the Territory, and details and results of experiments with wheat in 1900, consisting of early, medium, and late plowing; early medium, and late seeding; growing wheat continuously on the same soil with and without manure, and tests of varieties.

Bulletin 48, pp. 11.—Crop and Forage Notes, 1900.—This bulletin contains a report on the various crops under test at the station in order to determine suitable varieties, the best adapted soils, and the most desirable methods of cultivation.

Bulletin 49, pp. 32, pls. 11 (Popular edition, pp. 11, pls. 2).—A Rhizomorphic Root Rot of Fruit Trees.—Investigations on a root rot of fruit trees considered due to a new species of fungus, to which the name *Clitocybe parasitica* is given, are reported. The distribution of the disease is noted, the fungus is described, and preventive and remedial measures are suggested. An extensive bibliography is included.

Bulletin 50, pp. 11.—Manuring the Soil.—A popular discussion of this subject.

Annual Report, 1900, pp. 141, pls. 2, figs. 20.—This includes a report of the director on the work, publications, and staff of the station; a paper on the work of the experiment station; popular notes on the nature and treatment of Texas fever and hog cholera; a general discussion on diversified farming in Oklahoma, including suggestions on the culture of various crops; a summary of a large number of press bulletins issued by the station; results of the examination of 141 mineral specimens; analyses of 18 samples of water; a discussion of the principles of wine making, with analyses of 17 samples of Oklahoma wines; results of a test, with 20 steers, of the comparative feeding value of corn and Kafir corn fed with alfalfa hay and Kafir corn stover; a popular discussion of the propagation, cultivation, pruning, and trellising of grapes; brief descriptions of several diseases of grapes, with suggestions for their prevention; descriptive and remedial notes on various insects affecting grapes; a list of the varieties of fruits being tested at the station; notes on work in tree planting; a general article on feeding farm animals, with tables showing the composition of common feeding stuffs; a financial statement for the fiscal year ended June 30, 1900; and a list of the publications issued since the organization of the station.

GENERAL OUTLOOK.

The work of the Oklahoma Station is well directed and is confined to a few important lines bearing upon animal husbandry, including crop and forage experiments and the study of animal diseases, and

upon fruit growing and the development of diversified farming. In fruit growing the number of variety tests is being reduced and more attention is given to diseases, methods of culture, and management. The work in forestry has pointed out some of the most desirable trees to plant for the cheap and rapid production of material for fence posts and fuel. Press bulletins and popular bulletins on the work of the station and on methods employed by the leading farmers of the Territory meet with popular approval, and a plan now being formulated for general cooperative work with persons in different sections of the Territory in the study of plants, insects, and fungus diseases gives promise of valuable results. On account of its importance and the peculiar difficulties which are presented, the potato crop is receiving a large share of attention. Wheat also is an important crop that is claiming much attention from the station, and Bulletin 47, Reports of Wheat Raisers and Experiments with Wheat, is in great demand. The mailing list of the station has increased to such an extent that it was necessary to print 20,000 copies of the Annual Report for 1900–1901. During the year station officers assisted at five successful farmers' institutes.

OREGON.

Oregon Experiment Station, *Corvallis.*

Department of Oregon State Agricultural College.

GOVERNING BOARD.

Board of Regents: J. K. Weatherford (*Pres.*), *Albany;* John D. Daly (*Sec.*), *Corvallis;* B. F. Irvine (*Treas.*), *Corvallis;* W. E. Yates, *Corvallis;* Gov. T. T. Gerr, *Salem;* F. I. Dunbar (*Sec. State*), *Salem;* J. H. Ackerman (*State Supt. of Public Instruction*), *Salem;* W. P. Keady, *Portland;* Benton Killin, *Portland;* J. M. Church, *Lagrande;* John D. Olwell, *Central Point;* B. G. Leedy, *Tigardville.*

STATION STAFF.

Thos. M. Gatch, M. A., Ph. D., *President of the College.*
James Withycombe, V. S., *Dir.; Agr.*
George Coote, *Floriculture and Gard.*
A. B. Cordley, M. S., *Ent.*
E. R. Lake, M. S., *Hort. and Bot.*
A. L. Knisely, M. S., *Chem.*
Frank E. Edwards, B. M. E., *Asst. Chem.*
C. M. McKellips, M. S., Ph. C., *Asst. Chem.*
F. L. Kent, B. S. Agr., *Asst. Agr. and Dairy.*
E. F. Pernot, *Bact.*
T. H. Crawford, M. A., *Clerk and Purchasing Agent.*
Helen L. Holgate, *Sten.*

LINES OF WORK.

The work of the Oregon Station during the past year has included soil investigations to determine losses of nitrogen by leaching, chemical changes developed by different systems of rotation, the value of decomposed granite as a source of potash and its effect on the texture and

acidity of the soil, conservation of moisture, etc.; variety tests with cereals, forage crops, and garden vegetables; feeding experiments with sheep, swine, and dairy cows; dairy investigations; chemical studies with fruits, vinegars, forage crops, silage, plant foods, and soils, etc.; entomological investigations; bacteriological studies of diseases of poultry, sheep, goats, and calves, and with vinegars, yeasts, smuts, sheep dips, and milk; horticultural and botanical investigations, including plant breeding, root pruning and grafting, fruit preservation, protection by means of sheaths for the trunks of young orchard trees, and studies of native clovers, grasses, and poisonous plants.

The variety tests are conducted for the purpose of introducing grains adapted to the peculiar conditions of the region and forage plants capable of augmenting the protein-yielding feeding stuffs of the farm. The dairy instructor is studying the keeping qualities of separated milk, effect of pasteurization, methods of testing milk, and other dairy problems. The division of entomology and plant diseases has investigated a serious outbreak of the variegated cutworm (*Peridromia saucia*), continued the work on apple-tree anthracnose, brought to a conclusion the work of several years on the codling moth, and begun a study on the nature of prune-leaf curl. A study of foreign hops grown under local conditions has been undertaken. The station is cooperating with the Bureau of Plant Industry of this Department in experiments with sand-binding grasses, plants poisonous to live stock, and red clover to determine the influence of the origin of seed on the yield of crop. Cooperative experiments with legumes at Moro, in eastern Oregon, have been continued. The station conducts farmers' institutes with funds furnished by the State. A new evaporating plant (Pl. V, fig. 2) well equipped for technical and scientific work has been completed, and investigations in fruit evaporation and the utilization of secondary products of the orchard have been undertaken. The station chemist, entomologist, and bacteriologist have been released from college duties in order that they may devote their whole time to station work.

The State legislature at its last session appropriated $5,000 a year for two years for the establishment of a State experiment station in eastern Oregon, to be under the supervision of the station at Corvallis. The site chosen is at Union, Union County, where 640 acres of State land have been turned over to the station, and work in growing forage crops has been started. For the present this will be a seed-growing station to distribute seeds to ranchers in a cooperative way for the purpose of encouraging forage production and range improvement. Later, problems in stock feeding will be taken up. The farm buildings include a house and barn. A $3,000 station building for offices and storeroom will soon be erected.

INCOME.

The income of the station during the past fiscal year was as follows:

United States appropriation	$15,000.00
Farm products, including balance from previous year	3,044.02
Total	18,044.02

A report of the receipts and expenditures for the United States fund has been rendered in accordance with the schedules prescribed by this Department, and has been approved.

PUBLICATIONS.

The publications of this station received during the past fiscal year were Bulletins 63–65 and the Annual Reports for 1896, 1898, 1899, and 1900.

Bulletin 63, pp. 10.—A Preliminary Bulletin on the Prevention of Smut on Oats.—A preliminary report of a series of experiments on the prevention of smut in which seed oats were treated with solutions of copper sulphate and zinc sulphate, hot water, formalin, and sterilized dry hot air.

Bulletin 64, pp. 14, pl. 1, figs. 3.—Investigation of Diseases in Poultry.—An account of observations and investigations on the nature and treatment of avian tuberculosis, catarrhal roup, favus, scabies, pneumonia, congestion of the lungs, and indigestion.

Bulletin 65, pp. 36, pls. 3.—Creameries and Cheese Factories of Western Oregon.—Information on the organization and operation of some 70 creameries and cheese factories in western Oregon, inspected by the author of the bulletin, with miscellaneous notes on the Babcock test, feeding and production of cows in the State, packing and marketing butter, etc.

Annual Report, 1896, pp. 30.—Notes on the work and needs of the station and a financial statement for the fiscal year ended June 30, 1896.

Annual Report, 1898, pp. 68.—This contains a brief review of station work by the director; a financial statement for the fiscal year ended June 30, 1898; a report of the agriculturist, reviewing the work of the year and summarizing the results of experiments reported in previous publications of the station; a report of the chemist, containing miscellaneous analyses; a report of the entomologist, giving notes on various insects studied during the year; a report of the botanist, giving brief notes on Oregon weeds, plant diseases, native clovers, parasitic fungi, etc., and a report of the horticulturist, outlining the experiments undertaken during the year.

Annual Report, 1899, pp. 36.—A report of the director, a financial statement for the fiscal year ended June 30, 1899, and reports of the heads of departments reviewing the different lines of station work,

and giving briefly some of the results obtained, including miscellaneous chemical analyses.

Annual Report, 1900, pp. 32.—A report of the director, a financial statement for the fiscal year ended June 30, 1900, outlines of station work by the heads of departments, and results of cooperative experiments with sorghum.

GENERAL OUTLOOK.

The station is wisely directing considerable effort to the development of means for advancing the important fruit interests of the State. The utilization of secondary fruit products is an important factor for the fruit grower to consider, and is well worthy the attention of the station workers. The efforts of the station to introduce stock raising and dairying as a means for diversifying farm operations in the grain-producing sections are also praiseworthy and have met with encouraging results. The station is making a vigorous campaign against summer fallowing and is trying, with considerable success, to introduce the growing of legumes to improve soils. Much of the station work is being vigorously and intelligently carried on and the institution is growing in public favor. The college with which it is connected has recognized the increasing importance of its investigations by releasing several members of the staff from all college work, and the prospect for good work in the future is very promising. The division of dairying should have an equipment better adapted to station purposes, to the end that a larger amount of investigation in this line may be conducted. The offices of president of the college and director of the station have recently been separated.

PENNSYLVANIA.

The Pennsylvania State College Agricultural Experiment Station, *State College.*

Department of the Pennsylvania State College.

GOVERNING BOARD.

Board of Trustees—Advisory Committee: John A. Woodward (*Chair.*), *Howard;* Joel A. Herr, *Cedar Springs;* H. V. White, *Bloomsburg;* Samuel R. Downing, *Goshenville;* George W. Atherton, *State College;* H. P. Armsby (*Sec.*), *State College.*

STATION STAFF.

George W. Atherton, LL. D., *President of the College.*

H. P. Armsby, Ph. D., *Dir.*
William Frear, Ph. D., *V. Dir.; Chem.*
William A. Buckhout, M. S., *Bot.*
Geo. C. Butz, M. S., *Hort.*
George C. Watson, M. S., *Agr.*
Harry Hayward, B. S., *Dairy Husb.*
William C. Patterson, *Supt. Farm.*
Julia C. Gray, *Sec.*
J. A. Fries, B. S., *Asst. Chem.*
C. A. Browne, jr., M. A., *Asst. Chem.*
C. W. Norris, *Asst. Chem.*
Milton S. McDowell, *Asst. Chem.*
M. H. Pingree, B. S., *Asst. Chem.*
Nathan W. Buckhout, *Asst. Chem.*
James P. Pillsbury, *Asst. in Hort.*
A. K. Risser, *Asst. in Agr.*
W. T. Carter, B. S., *Fellow in Agr. Chem.*
Thorne M. Carpenter, *Asst. Chem.*

LINES OF WORK.

The work of the Pennsylvania Station during the past year has included studies of dried brewers' grains, pentosans, the humus content of soils, and methods of analyzing cattle feeds and timothy hay; fertilizer, variety, rotation, and cultural experiments with field crops; fertilizer, cultural, and curing experiments with tobacco; comparisons of soiling crops; botanical study of the influence of smoke and gases upon vegetation for the State department of agriculture; investigations in dairying, including bacteriological studies, an experiment in feeding dehorned cows loose in their pens, and investigations in breeding and selecting dairy cattle; and horticulture, especially variety tests, studies of San José scale and crown gall, and experiments in the use of hydrocyanic acid for the destruction of insects and fungi in greenhouses. The station has continued to cooperate with the State department of agriculture in the inspection of fertilizers, feeding stuffs, and seeds, and in experiments in watering and handling fattening steers.

During the past year a new series of experiments with forage crops, with special reference to their value as soiling crops for feeding dairy cattle, was inaugurated. Closely related to these experiments is a study of the value of manure from fattening cattle and the proportion of it recovered by different methods of handling. The station has taken up the examination of food products for the State dairy and food commission. During the year Prof. W. W. Cooke, formerly of the Colorado Agricultural College, has carried on at this station an interesting investigation upon the relative value of grain as compared with coarse fodder in the maintenance ration of sheep; also a study of fermentations in the digestive canal of ruminants, which seems to indicate that the present accepted views on that subject need more or less revision. The agriculturist of the station has published in the Rural Science Series a book on Breeds of Poultry. The respiration calorimeter constructed for investigations on the nutrition of large animals, in cooperation with the Bureau of Animal Industry of this Department, is practically completed and preliminary alcohol tests have been quite satisfactory. Great ingenuity and skill have been shown in the construction of this large and complicated apparatus and great interest will attach to its experimental use. Members of the station staff devote considerable time to the work of farmers' institutes, State and county fairs, and other lines of public service not directly connected with the work of the station proper.

INCOME.

The income of the station during the past fiscal year was as follows:

United States appropriation	$15,000.00
Fees	8,355.00
Farm products	4,723.97
Miscellaneous	95.46
Total	28,174.43

A report of the receipts and expenditures of the United States fund has been rendered in accordance with the schedules prescribed by this Department, and has been approved.

PUBLICATIONS.

The publications of this station received during the past fiscal year were Bulletins 52–54 and the Annual Report for 1899.

Bulletin 52, pp. 8.—Rye Meal and Quaker-oats Feed for Milk Production.—Report of an experiment covering 3 periods of 35 days each conducted with 9 cows to compare Quaker-oat feed and rye meal as feeding stuffs for milch cows.

Bulletin 53, pp. 8.—Methods of Steer Feeding.—Report of a cooperative experiment made by the station and the Pennsylvania department of agriculture to determine the comparative merits of feeding steers in pens and stalls.

Bulletin 54, pp. 7.—The Manurial Value of the Excreta of Milch Cows.—A record of the amount and composition of food eaten and of feces and urine excreted and milk produced by 2 cows during 50 days.

Annual Report, 1899, pp. 343, pls. 8, dgms. 23.—This includes the organization list of the station; a financial statement for the fiscal year ended June 30, 1899; a report of the director summarizing briefly the work of the station during the year; data on the cost of growing and the yield of dry and digestible matter per acre of corn, sugar beets, and mangels, and the results of a feeding experiment with 9 cows to determine their comparative value as dairy foods; details and results of 2 tests with 14 calves to determine the value of whole milk for the production of veal; a report of experiments begun in the fall of 1896 in cooperation with the Division of Forestry of this Department to study the effect of climate upon several widely distributed species of forest-tree seedlings; observations on the time and rate of formation of the annual ring of wood in the European larch and the white pine; notes on the depreciation of forest trees and results of the failure to cut trees at maturity; miscellaneous notes on diseases of oaks, the pine weevil, and shade trees for street planting; meteorological observations; lists of exchanges and available station publications; and reprints or more detailed accounts, including full experimental data of work reported in Bulletins 44–52 of the station.

GENERAL OUTLOOK.

The Pennsylvania Station has persistently followed a few main lines of investigation. One series of experiments in particular, namely, four-course rotations, has been conducted upon a uniform plan for the past nineteen years. These experiments involve the use of 144 plats of one-eighth acre each, and are probably the most extensive and long-continued experiments of the sort in the United States. Dairy hus-

bandry is a subject that has been given a leading place in the investigations of this station. The results, now nearly ready for publication, of three investigations upon the influence of protein supply upon milk production seem to indicate that some material modification of current views regarding the importance of a narrow nutritive ration in the feeding of dairy cattle will be necessary. Another closely related subject, animal nutrition, has received attention ever since the organization of the station. The completion of the respiration calorimeter will give this subject even greater prominence than before. The station is doing good work, but owing to lack of funds it is unable to meet all demands made upon it for inspection service, correspondence, and other routine work, and at the same time inaugurate and conduct new lines of research, however much the latter may be needed.

PORTO RICO.

Porto Rico Agricultural Experiment Station, *Rio Piedras, near San Juan.*

Under the supervision of A. C. True, Director Office of Experiment Stations, United States Department of Agriculture.

STATION STAFF.

F. D. Gardner, *Special Agent in Charge.* O. W. Barrett, *Ent. and Bot.*
James Mackinlay, *Farm Foreman.*

LINES OF WORK.

The work of the Porto Rico Station during the past year has included an agricultural survey of the island, comprising an inquiry into the condition of the various agricultural industries, soils, rivers, drainage, forests, roads, manufactures, wages, markets, education, and climate, by Prof. S. A. Knapp, of Louisiana, under instructions from the Director of this Office; also, a study of the agricultural conditions and possibilities of the island by Mr. F. D. Gardner, formerly of the Division of Soils of this Department, who was appointed in April, 1901, to the position of special agent in charge of the Porto Rico Experiment Station. Mr. Gardner's preliminary investigations began in May and continued throughout June and July. During the last three weeks in June and the first three weeks in July he was assisted by O. F. Cook and G. N. Collins, of the Bureau of Plant Industry of this Department.

INCOME.

The appropriation for the investigations in Porto Rico for the past fiscal year was $5,000, and for the current fiscal year is $12,000.

PUBLICATIONS.

A report on a portion of the work of the past year was published as House Document No. 171 (Fifty-sixth Congress, second session). A second report has been prepared and is submitted herewith (pp. 381–415).

GENERAL OUTLOOK.

The appropriation for the current year provides for the establishment and maintenance of an agricultural experiment station in Porto Rico. In accordance with this provision, steps have been taken for the establishment of such a station. As the appropriation available this year is not sufficient for the purchase of a tract of land suitable for the permanent location of the station, it was decided to start some experimental work on a temporary basis.

For this temporary work 30 acres of land adjacent to the town of Rio Piedras has been leased, together with a large frame house, which serves as a residence and office for the special agent and also furnishes accommodations for laboratories and a library. In addition to this the local normal school has donated temporarily the use of 40 acres of land for experimental purposes. The necessary horses, mules, and oxen have been secured and a stable constructed for their shelter. A farm wagon, an ox cart, several plows and harrows, together with garden and horticultural tools, have been secured, and a piece of land has been cleared of weeds, banana stumps, etc., and plowed. Bulbs, tubers, and quite a variety of vegetables have been planted, and a large number of vegetable seeds have been distributed to farmers. Cooperative work was commenced October 1, 1901, on a coffee plantation, with the object of improving methods of growing coffee in Porto Rico. Investigations have been started also to discover means for combating certain troublesome insects and fungus and bacterial diseases of plants.

The station has arranged to cooperate with the Bureau of Soils of this Department in making a soil survey of a portion of the island, beginning January 1, 1902. The organization of a regular station staff has been begun, the force now including the special agent in charge, the entomologist and botanist, and the farm foreman.

RHODE ISLAND.

Rhode Island Agricultural Experiment Station, *Kingston.*

Department of Rhode Island College of Agriculture and Mechanic Arts.

GOVERNING BOARD.

Board of Managers: Henry L. Greene (*Pres.*), *River Point;* Jesse V. B. Watson (*V. Pres.*), *Wakefield;* C. H. Coggeshall (*Clerk*), *Bristol;* Melville Bull (*Treas.*), *Newport;* Benj. A. Jackson, *Providence.*

STATION STAFF.

John H. Washburn, PH. D., *President of the College.*

H. J. Wheeler, PH. D., *Dir.; Chem.*
Fred W. Card, M. S., *Hort.*
Cooper Curtice, D. V. S., M. D., *Biol.; Poultryman.*
Burt L. Hartwell, [a] M. S., *Asst. Chem.*
Jas. W. Kellogg, B. S., *Asst. Chem.*
George E. Adams, B. S., *Asst. Field Expt.*
Alfred W. Bosworth, B. S., *Asst. Chem.*
L. P. Sprague, *Asst. Hort.*
Nathaniel Helme, *Met.*
S. Aline Nye, *Sten.*
Mary G. Schermerhorn, *Sten.*

[a] On leave.

LINES OF WORK.

As in previous years, the work of the Rhode Island Station during the past year has included plat and pot experiments with lime, sodium fertilizers, and rotations, and on the availability of fertilizer ingredients in soils and manures as affected by lime, magnesia, etc., with related chemical investigations; experiments with varieties, methods of planting, fertilizing, interpollination, etc., of bush fruits; experiments with small fruits, especially with strawberries and red raspberries, with a view to securing varieties suited to the locality; and poultry experiments, including breeding and feeding experiments with hens, geese, and pigeons, studies of poultry diseases, experiments in determining the best feeds and most favorable conditions for rearing incubator chicks and producing broilers, and studies to find a practical means of eradicating the blackhead disease from Rhode Island, so as to render possible the successful prosecution of the turkey industry. Breeding experiments with Belgian hares have been continued, as have also the tests of varieties of various seeds and plants in cooperation with this Department. The fertilizer and feeding stuffs inspection has been continued by the chemist and his assistants with State funds. September 1, 1901, the director of the station resigned and the chemist, H. J. Wheeler, was appointed to succeed him.

INCOME.

The income of the station during the past fiscal year was as follows:

United States appropriation	$15,000.00
Farm products	568.45
Miscellaneous, including balance from previous year	208.96
Total	15,777.41

A report of the receipts and expenditures for the United States fund has been rendered in accordance with the schedules prescribed by this Department, and has been approved.

PUBLICATIONS.

The publications of this station received during the past fiscal year were Bulletins 66–76 and the Annual Reports for 1899 and 1900.

Bulletin 66, pp. 14, pls. 7, dgm. 1.—Effect of Lime upon Grasses and Weeds.—Details and results of plat experiments extending over a number of years in which a study was made of the effect upon the relative yields and durability of grass and weeds of lime applied in connection with potash and phosphoric acid and different amounts of nitrate of soda, sulphate of ammonia, and dried blood.

Bulletin 67, pp. 8.—Commercial Fertilizers.—Analyses and valuations of 14 samples of fertilizers with explanatory notes.

Bulletin 68, pp. 18.—Treatment of the Sandy Soils of Rhode Island.—

A discussion of the needs and treatment of the Warwick Plain and other sandy soils of Rhode Island with the results of several plat and plain experiments.

Bulletin 69, pp. 30, pls. 3.—A Study of Plant Adaptations.—Observations upon the growth of a large number of different kinds of plants on an acid upland soil, limed and unlimed.

Bulletin 70, pp. 12.—Analyses of Commercial Fertilizers.—Analyses and valuations of 55 samples of fertilizers.

Bulletin 71, pp. 8.—Experiment in Top-dressing Grass Land.—Results for 1900 of experiments in applying no nitrogen and 150 and 450 pounds of nitrate of soda per acre to grass lands.

Bulletin 72, pp. 16, pls. 9.—Special Instruction in Poultry Culture.—The special course of instruction on the care and management of poultry which the station offers is described.

Bulletin 73, pp. 14.—Commercial Fertilizers.—Tabulated analyses of 73 samples of fertilizing materials not previously reported, with a summary of the results of fertilizer inspection.

Bulletin 74, pp. 24.—A Rotation of Crops.—An account of a rotation experiment with potatoes, rye, and clover, with a discussion of the advantages of crop rotations and a detailed history of the plats used in the experiment.

Bulletin 75, pp. 28.—A Four-year Rotation of Crops.—A detailed description of the conditions of a rotation experiment with corn, potatoes, rye, and clover, with the results obtained.

Bulletin 76, pp. 26.—A Five-year Rotation of Crops.—Detailed results for the first year of a rotation experiment with corn, potatoes, and rye one year each, and grass two years.

Annual Report, 1899, pp. 139, pls. 2.—This includes a report of the director giving a general review of the work of the station during the year; a financial statement for the fiscal year ended June 30, 1899; lists of donations, exchanges, and station publications; and departmental reports containing in addition to summaries of the different lines of work results of several experiments with orchard fruits and lettuce, an account of experiments with carnations for the prevention of stem rot, miscellaneous chemical analyses, studies of the amount of humus in soils and the percentage of nitrogen in the humus as affected by applications of air-slaked lime and certain other substances, a brief account of four cooperative experiments with grasses in continuation of earlier investigations on the lime requirements of Rhode Island soils, observations upon the after effect of sulphur when applied to soils for the purpose of preventing potato scab, results of a comparative trial of different clover and grass mixtures for seeding, results of experiments in liming grass lands before and after seeding, observations upon the effectiveness of nitrate of potash as compared with like amounts of nitrogen and potash in form of muriate of potash and nitrate of soda,

a popular discussion of poultry breeding, and meteorological observations.

Annual Report, 1900, pp. 191, pls. 10.—This includes the organization list of the station; a report of the director reviewing the work of the station during the year and giving notes on the annual meeting of the Association of American Agricultural Colleges and Experiment Stations; a list of station publications during the year and notes on the station staff; departmental reports reviewing in detail the different lines of station work and containing results of investigations concerning the life history and transmission of the organism producing roup, observations on the apple maggot and the stem rot of carnations, notes on the treatment of an old apple orchard, a study of the frost resistance of three varieties of bush beans, results of experiments in forcing lettuce and rhubarb, an account of work in the crossing and selection of strawberries, a popular article on horticulture from an educational standpoint, miscellaneous chemical analyses, a summary of results of pot and plat experiments on the acidity of upland soils begun in 1894, a popular discussion of heredity with special reference to poultry, meteorological observations; a financial statemement for the fiscal year ended June 30, 1900; and list of donations, exchanges, and of the publications of the station since its organization.

GENERAL OUTLOOK.

Rhode Island is peculiarly adapted to intensive farming. Old worn-out areas should be rejuvenated and new industries adapted to local conditions must be developed; hence the importance of investigating problems related to the improvement of the soil, and the development of the poultry and fruit industries. The station officials are giving much attention to rotation and fertilizer experiments, especially the application of lime to acid soils and of top-dressing to old grass lands, supplementing plat experiments by pot experiments; to the rejuvenation of old apple orchards and problems affecting the production of small fruits and garden truck and to poultry production. An effort will be made to discover the most wholesome feeds for incubator chicks, causes of mortality in incubator chicks, and means for combating troublesome poultry diseases. The poultry plant has been removed to a new and more suitable location, and reduced in size, but improved in condition.

Station officers attend farmers' institutes to a limited extent, cooperate with the college in conducting correspondence and nature study courses, and do a considerable amount of teaching in the college. Cooperative experiments with crops are carried on with farmers in different parts of the State with decided success. A greenhouse suitable for horticultural investigations is needed. The station is under efficient management and apparently has before it a career of increased usefulness to the agricultural interests of the State.

SOUTH CAROLINA.

South Carolina Agricultural Experiment Station, *Clemson College.*[a]

Department of Clemson Agricultural College.

GOVERNING BOARD.

Board of Trustees: R. W. Simpson (*Pres.*), *Pendleton;* P. H. E. Sloan (*Sec. and Treas.*), *Clemson College;* D. K. Norris, *Hickoryflat;* M. L. Donaldson, *Greenville;* R. E. Bowen, *Briggs;* B. R. Tillman, *Trenton;* J. E. Bradley, *Hunters;* W. D. Evans, *Cheraw;* L. A. Sease, *Lewiedale;* J. E. Wannamaker, *St. Matthews;* A. T. Smythe, *Charleston;* C. S. Garris, *Spartanburg;* J. E. Tindal, *Silver;* J. H. Hardin, *Chester.*

STATION STAFF.

Henry S. Hartzog, LL. D., *President of the College and Director.*

J. S. Newman, *V. Dir.; Agr.*
M. B. Hardin, *Chem.*
B. F. Robertson, B. S., *Asst. Chem.*
F. S. Shiver, Ph. G., *Asst. Chem.*
D. H. Henry, B. S., *Asst. Chem.*
C. M. Conner, B. Agr., B. S., *Asst. Agr. and Dairyman.*
C. C. McDonnell, *Asst. Chem.*
R. N. Brackett, Ph. D., *Asst. Chem.*
C. C. Newman, *Hort.*
Chas. E. Chambliss, *Ent., Bot., and Bact.*
G. E. Nesom, B. S., D. V. M., *Vet.*
C. O. Upton, *Dairyman.*
J. S. Pickett, *Station Foreman.*
J. N. Hook, *Sec.*

LINES OF WORK.

The work of the South Carolina Station during the past year has included variety, cultural, and fertilizer experiments with wheat, cotton, and forage crops; cultural and fertilizer experiments with oats, peas, sweet potatoes, tobacco, chufas, artichokes, melons, and other miscellaneous crops; pasturage and other experiments with breeds of swine for economic pork production; experiments with poultry for egg and meat production; experiments with Carolina rice meal as a feed for milch cows and for young pigs; investigation of the chemical composition of the rice plant and its products; analysis of fertilizers, drinking water, minerals, ores, and soils; entomological investigations, especially with the chinch bug, parasites of poultry, and insects injurious to the cotton plant, peanut, pecan, and the grapevine; diseases of animals, especially Texas fever, glanders, and milk fever. For cows having milk fever the veterinarian has devised a modification of the apparatus for giving the Schmidt treatment, which it is claimed is very effective in reducing the number of deaths. Other work includes the investigation of plant diseases, including cotton-boll rot, potato rot, rusts, smuts, blights, black knot, peach yellows, etc.; plant breeding experiments with varieties of peaches and oranges; experiments with spraying solutions for peach trees and grapevines; growing ginseng; fertilizer and variety experiments with potatoes and garden vegetables; and forcing-house tests with lettuce, cucumbers, tomatoes, strawberries, and cauliflower.

[a] Telegraph office, *Clemson College*, express and freight address, *Calhoun.*

During the year the station has been given funds for improving to a considerable extent its equipment, the most notable improvements being new equipment for soil physics and for evaporating sweet potatoes, a new poultry house for incubators and brooders, and a large addition to the chemical laboratory. The laboratory of the station botanist has been separated from that used by students; a more complete separation of station land and live stock from that used by the other departments of the college has been made; a cottage has been built for the station foreman; and other changes have been made which will facilitate the experimental work of the station. Members of the staff take part in farmers' institutes, which are growing in favor, the college institute especially having an attendance of nearly 500 farmers from all parts of the State. During the year the botanist resigned to accept a position in this Department, and the vacancy caused by the resignation of the entomologist was filled by the appointment of Charles E. Chambliss.

INCOME.

The income of the station during the past fiscal year was as follows:

United States appropriation	$15,000.00
Farm products	783.26
Total	15,783.26

A report of the receipts and expenditures for the United States fund has been rendered in accordance with the schedules prescribed by this Department, and has been approved.

PUBLICATIONS.

The publications of this station received during the past fiscal year were Bulletins 54–63.

Bulletin 54, pp. 13.—Analysis of Commercial Fertilizers.—Tabulated analyses and valuations of 154 samples of fertilizers.

Bulletin 55, pp. 7.—Feeding Rice Meal to Pigs.—A comparison with 6 pigs of feeding corn meal and rice meal supplemented by skim milk.

Bulletin 56, pp. 12.—Wheat.—Results of variety, seeding, fertilizer, and culture experiments with wheat during 1900.

Bulletin 57, pp. 16.—Fungicides.—A general discussion covering the preparation and use of fungicides.

Bulletin 58, pp. 27, pls. 14, figs. 5.—Grapes.—A popular bulletin on grape culture, including the laying out of the vineyard, planting, cultivation, pruning, training, trellises, spraying, selection of varieties, etc.

Bulletin 59, pp. 16.—A Chemical Investigation of the Rice Plant

and of the Product and By-products of the Rice Industry.—Notes on the history and production of rice, a brief description of the processes employed in milling or cleaning the grains, and tabulated analyses of 21 samples, comprising parts of the rice plant and various by-products.

Bulletin 60, pp. 24.—Analysis of Commercial Fertilizers.—Analyses of 186 samples of fertilizing materials, with a discussion of the composition and valuation of fertilizers and the laws and regulations governing the sale of commercial fertilizers in South Carolina.

Bulletin 61, pp. 12, pls. 3.—Corn.—Culture, fertilizer, and variety tests with corn are reported in tabular form and briefly discussed.

Bulletin 62, pp. 11, pls. 2.—Capons and Caponizing.—Brief notes are given on the value of capons and the method of caponizing is described.

Bulletin 63, pp. 37.—Sweet Potato.—Experiments to determine the effect of fertilizing with different forms of potash upon the starch content of the sweet potato, the effect of storing upon the composition of sweet potatoes, and the relative value of several methods of storing in general use are reported.

GENERAL OUTLOOK.

The station is striving with considerable success for the development of greater diversity in agricultural production, especially along the lines of dairying, fruit growing, and market gardening, and for the instruction of the farming population by means of farmers' institutes. During the year marked progress has been made in the separation of the station equipment from that of other departments of the college, and the management of the station has been put on a more independent basis. According to by-laws of the board of trustees published in 1900, the direct management of the station is now committed to the vice-director, the president of the college exercising only general supervision, and the board of trustees having nothing to do with the details of the work. On the whole, the conditions at this station are greatly improved and there is promise of still more effective work in the near future.

SOUTH DAKOTA.

South Dakota Agricultural Experiment Station, *Brookings.*

Department of South Dakota Agricultural College.

GOVERNING BOARD.

Regents of Education: Frederick A. Spafford (*Pres.*), *Flandreau;* I. D. Aldrich (*Sec.*), *Bigstone;* I. W. Goodner, *Pierre;* M. F. Greeley, *Gary;* L. M. Hough, *Sturgis;* R. M. Slocum, *Mound City.*; R. A. Larson (*Sec. and Accountant*).

STATION STAFF.

John W. Heston, M. A., PH. D., LL. D., *President of the College and Acting Director.*
E. C. Chilcott, M. S., *V. Dir.; Agr.*
Jas. H. Shepard, B. S., *Chem.*
De Alton Saunders, M. A., *Bot.*
E. L. Moore, B. S., D. V. S., *Animal Path.*
N. E. Hansen, M. S., *Hort.*
W. S. Thornber, *Asst. Hort.*
A. B. Holm, B. S., *Asst. in Soils.*
A. H. Wheaton, *Asst. in Dairying.*
R. F. Kerr, *Libr.*
R. A. Larson, *Accountant.*
Frank G. Orr, *Sec.*

LINES OF WORK.

The work of the South Dakota Station during the past year has proceeded along the same general lines as noted in previous reports, attention being given to the analysis of soils, forage plants, and grain; studies of diseases of plants and animals; experiments in testing varieties and breeding vegetables, cereals, and fruits; tree planting; digestion experiments, and studies of the effect of farm manure and methods of tillage on soil moisture and the physical condition of soils. The department of chemistry has completed the work in soil analysis and prepared the results for publication. The veterinarian is studying diseases of sheep and swine, and the assistant in dairying is doing some work in testing milk. A State veterinarian appointed July 1, 1901, will cooperate with the station veterinarian in studying anthrax.

The station is cooperating with the Bureau of Forestry of this Department in tree planting and with the Bureau of Plant Industry in experiments for renewing worn-out pasture lands. The latter experiments are being conducted at Highmore, where about 20 acres are devoted to the purpose, besides about 50 acres devoted to tests of forage crops. The station has also tested a large number of varieties of wheat, barley, spelt, and other plants sent out by this Department. Macaroni wheats have made a good showing. In the horticultural department breeding experiments are being conducted on a very extensive scale. Many thousand seedlings of native fruits are being raised for the purpose of originating new varieties suited to the climate, and hardy stocks of various kinds are being tried. An effort is being made to improve the stubble berry or nightshade (*Solanum nigrum*) as found upon the prairies of the State. The fruit of this plant is much used by the prairie settlers for canning and for making pies and preserves. The need of a hardy race of strawberries has led the station to begin crossing the wild strawberries of the Dakotas and Manitoba with cultivated sorts. Breeding experiments are being conducted also with hazelnuts, wild grapes, and buffalo berries. The legislature at its last session appropriated $40,000 for an engineering and physics building for the college and $10,000 for a building to be devoted to plant breeding. The latter will directly benefit the station. At the beginning of the present fiscal year the director was removed and the president of the college was made acting director of the station.

INCOME.

The income of the station during the past fiscal year was as follows:

United States appropriation	$15,000.00
State appropriation	1,000.00
Farm products	817.74
Miscellaneous	500.00
Total	17,317.74

A report of the receipts and expenditures for the United States fund has been rendered in accordance with the schedules prescribed by this Department, and has been approved.

PUBLICATIONS.

The publications of this station received during the past fiscal year were Bulletins 66–69 and the Annual Reports for 1899 and 1900.

Bulletin 66, pp. 20.—Drought-resisting Forage Plants at the Cooperative Range Experiment Station, Highmore, S. Dak.—Results of tests for one year of different forage plants, with mechanical and chemical analyses of the soils of Highmore.

Bulletin 67, pp. 50, pls. 7.—Watermelons and Muskmelons in South Dakota.—Results are here reported in tables and descriptive notes of tests of a large number of varieties of foreign and American watermelons and muskmelons during the years 1898 and 1899.

Bulletin 68, pp. 56, pls. 11.—Vegetables in South Dakota.—Results of tests of a large number of varieties of vegetables and of culture experiments, including subsoiling and starting plants in a cold frame as compared with starting in a greenhouse.

Bulletin 69, pp. 54, pls. 3, figs. 9.—Native and Introduced Forage Plants.—Descriptions, notes on distribution, and chemical analyses of over 40 grasses and forage plants.

Annual Report, 1899, pp. 8.—Brief abstracts of Bulletins 61–64 of the station, and a financial statement for the fiscal year ended June 30, 1899.

Annual Report, 1900, pp. 34.—A general account of the work of the station during the year is given in the reports of the director, agriculturist, horticulturist, chemist, entomologist and botanist, and the zoologist and veterinarian. A financial statement for the fiscal year ended June 30, 1900, is included.

GENERAL OUTLOOK.

The South Dakota Station continues to direct much of its effort to the introduction and development of hardy and drought-resistant varieties of agricultural and horticultural plants, and to this end is testing introduced varieties from high latitudes in Europe, growing native and seedling varieties, and crossing native on introduced plants. The

divisions of agriculture, botany, and horticulture are cooperating in this work and their efforts give promise of valuable results. Difficulties in the administration of this station have of late been a hindrance to its work. There is still need of a settled policy of management by which the work of the station will be clearly differentiated from that of other departments of the college. The station should again have a separate director, who should be made fully responsible for its work and expenditures, and be given authority to control the funds of the station and the work of members of the staff in accordance with a well matured plan of investigations.

TENNESSEE.

Tennessee Agricultural Experiment Station, *Knoxville.*

Department of the University of Tennessee.

GOVERNING BOARD.

Board of Trustees—Experiment Station Committee: J. W. Caldwell (*Acting Chair.*), *Knoxville;* T. E. Harwood, *Trenton;* T. F. P. Allison, *Nashville;* O. P. Temple, *Knoxville;* J. B. Killebrew, *Nashville;* Harris Brown, *Gallatin.*

STATION STAFF.

Chas. W. Dabney, Ph. D., LL. D., *President of the College.*

Andrew M. Soule, B. S. A., *V. Dir. and Agr.*
Charles A. Keffer, B. H., *Hort. and For.*
C. A. Mooers, B. S., *Chem.*
S. M. Bain, B. A., *Bot.*
Weston M. Fulton, *Met.*
John R. Fain, *Farm Manager.*
Phares O. Vanatter, *Plat Expert.*
Samuel E. Barnes, B. S., M. S. A., *Dairyman.*
M. Jacob, V. M. D., *Vet.*
Ethel Reese, *Sten.*
F. H. Broome, *Libr.*

LINES OF WORK.

The work of the Tennessee Station during the past year has been continued along the same general lines as formerly, and has included plat and field experiments with clovers and other legumes for forage and green manuring and with wheat and grasses; dairying; feeding experiments with dairy and beef cattle and hogs; horticultural investigations, including orchard work, spraying, and variety tests of strawberries; study of the effect of fungicides on foliage; chemical study of soils, combined with cooperative field experiments in various parts of the State, and meteorological observations. The station is cooperating with the Bureau of Plant Industry of this Department in investigations of the influence of origin of red-clover seed on the yield of crop and experiments in the formation and management of meadows and pastures.

Early in the year the agriculturist was made vice-director and placed in charge of the station work. A farm foreman was employed

so that the farm manager might have more time for experimental work in animal husbandry, and other changes were made, all of which places the staff on a better basis for specialization along lines of research. A change in policy with regard to the dairy herd was made, the idea being to secure a herd of pure-bred Jerseys, and 10 animals were purchased. The investigation of the growth of young apple trees has been continued. In the agricultural department the equipment has been considerably improved, and in the meteorological department an automatic electrical recording river gauge has been perfected. The library received a donation of over 150 books from the president of the university. The station has begun issuing frequent press bulletins, which are quite generally used by the newspapers of the State. Farmers' institutes are attended by members of the staff.

INCOME.

The income of the station during the past fiscal year was as follows:

United States appropriation	$15,000.00
Farm products	3,709.11
Total	18,709.11

A report of the receipts and expenditures for the United States fund has been rendered in accordance with the schedules prescribed by this Department, and has been approved.

PUBLICATIONS.

The publications of this station received during the past fiscal year were Bulletins Vol. 13, Nos. 2–4, and Vol. 14, No. 1, and the Annual Report for 1900.

Bulletin Vol. 13, No. 2, pp. 24, pl. 1, figs. 5.—Experiments with Winter Wheat.—Experiments with wheat, including fertilizer and variety tests, intertillage experiments, and trials of different rates of seeding, and seed selection are reported in detail and the results are discussed at some length.

Bulletin Vol. 13, No. 3, pp. 23, pl. 1, fig. 1.—Fertilizer Experiments during 1900.—The experiments reported in this bulletin consist of tests of fertilizers for potatoes, corn, cowpeas, and peanuts, and the effects of fertilizer applications on the germination of the seeds of these crops. The results are given in tabular form and discussed.

Bulletin Vol. 13, No. 4, pp. 23, figs. 8.—Feeding Native Steers.—An account of tests with 8 steers of the comparative value of cotton-seed meal and cowpea vine hay as sources of protein and the feeding value of finely ground cotton-seed hulls or cotton-seed bran, with a summary of the results obtained.

Bulletin Vol. 14, No. 1, pp. 31, pl. 1, figs. 11.—Experiments with Corn, Forage Crops, and Spring Cereals.—This bulletin reports the results of tests of varieties of corn, sorghum, Kafir corn, durra, broom corn, cowpeas, millet, Canadian field peas, and spring varieties of wheat, oats, and barley; and of tests of sowing rape, oats, and barley at different dates, and of seed corn taken from different parts of the ear. The draft these crops make on the soil and the root systems of corn, sorghum, cowpeas, and soy beans were also studied.

Annual Report, 1900, pp. 40, pls. 2, figs. 11, charts 3.—This includes a general outline of station work during the year; a history of the station from 1882 to 1900, with a list of publications issued during that time; reports by the agriculturist, botanist, horticulturist, chemist, and librarian reviewing the work of the different departments; a brief discussion of the object, construction, and use of daily weather charts by the meteorologist, and a financial statement for the fiscal year ended June 30, 1900.

GENERAL OUTLOOK.

The Tennessee Station is conducting a number of lines of work of great importance to the agriculture of the State. Its efforts to introduce improved varieties of winter cereals are important because the culture of such crops keeps the ground covered, prevents losses of nitrogen and the washing of soil, and enables the production of large quantities of grain for feeding live stock. Of closely related importance are the establishment of good pastures and meadows, and the production of legumes for silage and for green forage. The station has demonstrated that wheat, barley, and oats can be profitably grown in Tennessee, and that they can be removed in time to sow cowpeas, sorghum, corn, etc., for silage or winter feeding. The exhausted condition of many of the soils of the State gives importance to studies relating to the rotation of crops and the restoration of fertility by means of natural and artificial fertilizers and green manuring crops. By the use of green manures alone the station has shown that some of the poorest and most neglected soils of the State can be reclaimed. Other important work has been the chemical examination of the cotton plant, the utilization of cotton-seed meal in feeding beef and dairy cattle, the successful spraying of fruit trees for fungus diseases and injurious insects, and the preparation of a soil map of the State.

The dissemination of information regarding these investigations through the station publications, the newspapers of the State, attendance of the staff upon farmers' institutes and meetings of farmers at the university has brought the farmers in touch with the station and widened its sphere of influence. These conditions and the organization of the staff on a more efficient basis put the station in a position to be of great usefulness to the agriculture of the State.

TEXAS.

Texas Agricultural Experiment Station, *College Station.*[a]

Department of the State Agricultural and Mechanical College of Texas.

GOVERNING BOARD.

Board of Directors: M. Sansom (*Pres.*), *Alvarado;* F. A. Reichardt, *Houston;* A. C. Oliver, *Douglassville;* William Malone, *Hunter;* P. H. Tobin, *Denison;* A. P. Smyth, *Mart;* John W. Kokernot, *San Antonio;* Jeff Johnson, *Austin.*

STATION STAFF.

R. H. Whitlock, M. E., *President pro tem. of the College.*

J. H. Connell, M. S., *Dir.*
H. H. Harrington, M. S., *Chem.*
M. Francis, D. V. M., *Vet.*
R. H. Price, B. S., *Hort.*
B. C. Pittuck, B. S. A., *Agr.*
P. S. Tilson, B. S., *Asst. Chem.*
E. A. White, *Asst. Hort.*
J. W. Walden, B. S., *Student Asst. in Hort.*
K. K. Hooper, *Chief Clerk.*
J. G. Harrison, *Bookkeeper.*
J. J. Hooper, *Sten. and Clerk.*
S. A. McHenry, *Supt. State Sta.* (*Beeville*).
J. W. Carson, B. S. A., *Supt. of Farm.*

LINES OF WORK.

The principal lines of work undertaken at the Texas Station during the past year, named in the order of the effort and money expended in their support, are as follows: Experiments with grasses, forage plants, corn, cotton, and fertilizers in cooperation with more than 100 farmers throughout the State; investigation of the Texas fever problem, especially methods of treatment after inoculation to reduce the fatality resulting from inoculation; experiments with orchard fruits, dewberries, blackberries, strawberries, and figs; investigations in making molasses from sugar cane for the purpose of increasing the value of this crop when grown upon farms not convenient to sugar-houses. The station is cooperating with this Department as follows: With this Office in irrigation investigations; with the Bureau of Plant Industry in efforts to improve the wheat industry and in experiments at selected points to test the adaptability of certain forage plants for meadows and pastures; with the Bureau of Forestry in tree planting; with the Bureau of Chemistry in studying the influence of environment on the sugar content of muskmelons; with the Bureau of Soils in the selection of typical soil areas, and with the Division of Entomology in studies of the Mexican cotton-boll weevil.

The completion of the new agricultural and horticultural building and the purchase of valuable equipment have materially improved the facilities for station work. In this building a cannery is being equipped, partly for experimental purposes. During the session of the legislature held the past summer liberal appropriations for both college and station were made. Five thousand dollars was added to

[a] Express and telegraph address, *Bryan.*

the general maintenance fund; $3,100 was appropriated for building and equipping a chemical and veterinary laboratory for college and station; $1,500 was added to the State entomologist's appropriation; the appropriation for the Beeville substation was increased from $5,000 to $7,500 (for two years); and $5,000 per annum was voted for the establishment and maintenance of a new substation.

The work of the Beeville substation has consisted of variety tests with fruit, general orchard, and vineyard work, together with extensive variety, cultural, and fertilizer experiments with watermelons, cantaloupes, and onions. The work is supervised by the agriculturist of the station and is in charge of a resident superintendent.

INCOME.

The income of the station for the past fiscal year was as follows:

United States appropriation	$15,000.00
State appropriation	2,500.00
Miscellaneous, including balance from previous year	691.47
Total	18,191.47

A report of the receipts and expenditures for the United States fund has been rendered in accordance with the schedules prescribed by this Department, and has been approved.

PUBLICATIONS.

The publications of this station received during the past fiscal year were Bulletins 57 and 58.

Bulletin 57, pp. 24, pls. 10.—Cabbage.—Fertilizers, Varieties, Shipping; Cauliflower.—Varieties and Shipping.—General directions for growing and marketing cabbage and cauliflower, including a financial statement of the sale of a carload of cabbage shipped by the station to Kansas City and an estimate of the cost of growing an acre of cabbage; and detailed data for rather extensive fertilizer and variety tests.

Bulletin 58, pp. 18, figs. 15.—Pruning and Training Peach Orchards.—This subject is discussed at some length, proper and faulty methods of pruning the peach being illustrated and results from other stations relative to the Stringfellow method of root pruning being quoted.

GENERAL OUTLOOK.

During the year a relatively large amount of attention has been given to the extension of cooperative experiments with farmers, which have been found potent means for improving agricultural practice, in developing new industries, and bringing the farmers into sympathy with the work of the station. Much attention is also given to unsolved

problems in the investigations on Texas fever and to the development of horticultural interests, especially truck farming in the southern part of the State. The college and station have succeeded in enlisting the cordial support of farmers, stockmen, and horticulturists. In July of this year the annual session of the Texas Farmers' Congress, of which Director Connell is president, was held at the college. It was attended by about 450 delegates, representing the following 12 associations: State Horticultural Society, Texas Jersey Cattle Club, Texas Dairymen's Association, Texas Cotton Growers' Association, Texas Live Stock Association, Texas Truck Growers' Association, Texas Floral Association, South Texas Truck and Fruit Growers' Association, Central Texas Beekeepers' Association, Texas Poultry, Pigeon, and Pet Stock Association, Texas Nurserymen's Association, and the Women's Industrial Section. Resolutions were adopted indorsing the work of the station, favoring the establishment of more substations, and urging the organization of farmers' institutes in all parts of the State. In this and other ways it is evident that the work of the station is making a strong impression on the farmers of the State, and, with its improved facilities and enlarged resources, the outlook for its greater usefulness is very promising.

UTAH.

Agricultural Experiment Station, *Logan.*

Department of the Agricultural College of Utah.

GOVERNING BOARD.

Board of Trustees: W. S. McCormick (*Pres.*), *Salt Lake City;* P. W. Maughan (*Sec.*), *Logan;* Allan M. Fleming (*Treas.*), *Logan;* Mrs. Emily S. Richards, *Salt Lake City;* D. C. Adams, *Salt Lake City;* John A. McAlister, *Logan;* L. Hansen, *Wellsville;* Mrs. R. N. Bagley, *Ogden;* Seth A. Langton, *Logan.*

STATION STAFF.

W. J. Kerr, D. Sc., *President of the College.*

J. A. Widtsoe, Ph. D., *Dir.; Chem.*
F. B. Linfield, B. S. A., *Animal Indus.*
G. L. Swendsen, C. E., *Hydraulic Engin.*
Ephraim G. Gowans, M. D., *Biol.*
James Dryden, *Met. and Poultry Manager.*
Lewis A. Merrill, B. S., *Agron.*
W. W. McLaughlin, *Asst. Chem.*
J. A. Wright, *Hort.*
P. A. Yoder, Ph. D., *Asst. Chem.*
Charles Batt, *Foreman Hort. Grounds.*
John A. Crockett, *Asst. Dairyman.*
Allan M. Fleming, *Treas.*
Peter W. Maughan, *Sec.*
J. B. Nelson, *Foreman of Farm.*

LINES OF WORK.

The work of the Utah Station during the past year continued to adhere closely to irrigation. The principal subjects of investigation were the duty of water for garden vegetables, small fruits, and the orchard; measurement and division of water; the laws of the flow of

water, seepage, evaporation, and methods of irrigation; survey of actual irrigation conditions; dry farming; experiments with wheat, oats, and barley to develop varieties with drought-resisting properties; grasses and forage crops for the arid West; curing and handling alfalfa; destruction of dodder; rotation of crops; plants for alkali lands; feeding value of crops grown with different amounts of water; pasture *v.* soiling on irrigated lands; the value of alfalfa fed with other fodders; dairy by-products in feeding hogs and calves; feeding experiments with sheep and dairy cows; alfalfa *v.* timothy for horses; influence of alfalfa on the color and flavor of butter; testing varieties of fruit trees; experiments to originate red winter apples; keeping qualities of apples; spraying experiments; effects of thinning peaches and ringing grapevines; silk culture; forcing-house tests with tomatoes, lettuce, rhubarb, mushrooms, winter muskmelons, and watermelons; chemical investigations, including the effect of irrigation on the composition of plants, digestibility of plants grown with different amounts of water, irrigation *v.* soil fertility, alkali lands and their reclamation, irrigation waters, soil survey of Utah, and soil moisture in irrigation work; poultry experiments, including breeding experiments to develop good layers, feeding experiments, methods of feeding and management, relative profitableness of different breeds, pullets *v.* hens for layers, artificial incubation, and value of caponizing. Irrigation investigations in cooperation with this Office have been continued. Cooperative work has also been arranged with several bureaus of this Department, and includes sugar-beet investigations with the Bureau of Chemistry, tree planting with the Bureau of Forestry, experiments with grasses and forage plants for arid and alkali soils with the Bureau of Plant Industry, and investigations of alkali soils with reference to seepage and drainage with the Bureau of Soils.

The State legislature at its last session was quite liberal to the college and station, giving them about $108,000. Of this amount $10,000 has been expended in the construction of a cattle barn and a sheep barn and in the remodeling of the old barn; $3,800 has been set aside for use in purchasing pure-bred stock; $1,550 for hog pens, yards, fences, floors, etc.; $1,500 for a vegetation house; $1,000 for purchasing land on the plains for experimental purposes, and $250 for a water right. All of these expenditures will be mainly for the benefit of the experiment station, which will thus be well equipped, especially for work in animal husbandry and irrigation. Owing to the diseased condition of the old herds, all live stock, with the exception of horses, has been disposed of and only new, sound animals will be put in the new barns. The legislature also appropriated $6,000 for two years for a fruit experiment station at St. George, to be known as the Southern Utah Experiment Station. The college expended during the year $1,500 in promoting the farmers' institute movement, station

officers doing most of the work. During the year the horticulturist, C. P. Close, resigned to accept a similar position at the Delaware College and Station.

INCOME.

The income of the station during the past fiscal year was as follows:

United States appropriation	$15,000.00
Farm products	4,054.08
Balance from previous year	727.77
Total	19,781.85

A report of the receipts and expenditures for the United States fund has been rendered in accordance with the schedules prescribed by this Department, and has been approved.

PUBLICATIONS.

The publications of this station received during the past fiscal year were Bulletins 66–71 and the Annual Report for 1900.

Bulletin 66, pp. 10, pls. 2.—Corn Experiments.—Results of tests of 17 varieties of corn during periods of 5 to 10 years are given, with notes on leading varieties; and tests of the relative value of deep and shallow tillage, of hilling and level tillage, and of thick and thin planting are reported in full and results secured at other stations in tests of hill *v.* drill culture of corn are discussed.

Bulletin 67, pp. 42, pls. 6.—Poultry Experiments.—Experiments here reported in detail and summarized included tests of the relative value of pullets and hens and of early and late hatched pullets; the effect of exercise on egg production; the feeding value of corn, dried blood, and sunflower seed; and of the value of caponizing.

Bulletin 68, pp. 148, figs. 7, dgms. 9.—Experiments with Dairy Cows.—Part I of this bulletin contains records of the station dairy here for 5 years, results of studies of the influence of the weight of the cow, period of lactation, dehorning, methods of feeding, type, and change of milkers upon the yield and quality of milk and the economy of production, and data showing the variations in the different constituents of the milk of a number of cows, with a discussion of methods of testing cows and sampling milk at creameries. Part II gives an account of feeding tests with milch cows made each winter for 4 years to compare alfalfa alone with alfalfa and corn fodder. Part III gives the results of summer feeding experiments for 4 years in soiling and pasturing to compare the results obtained from 1 acre of land when the crop was pastured and when it was soiled, to study the effect of feeding grain to cows on pasture, and to test the relative effects of soiling and pasturing on alfalfa and mixed grasses. The bulletin also

contains notes on the management of cows on pasture in relation to bloat, and a general summary.

Bulletin 69, pp. 30.—The Golden Vine Field Pea.—Results of investigations of the chemical composition of the whole plant, leaves, stalks, and flowers of the Golden Vine field pea at different stages of growth; data on the yield per acre; results of artificial digestion experiments with the whole plant and different parts; and discussions of the food value of this plant and related topics.

Bulletin 70, pp. 70, pls. 4.—Experiments in Pork Production.—Tests covering several years are reported of summer feeding of pigs in which the value of mixed pasturage, alfalfa pasturage, and the effects of exercise were the principal questions studied and of winter feeding, in which a special study was made of the value of roots and alfalfa. Tests of the feeding value of rape and of the comparative value of barrows *v.* sows and of spayed *v.* unspayed sows are also reported, and several general questions bearing on the investigations are discussed, including the effects of feeding balanced rations, wet and dry grains, skim milk and grain, and whole milk and grain.

Bulletin 71, pp. 56, figs. 42.—Carrying Capacities of Irrigation Canals.—This is a report of 64 experiments made during the summer of 1897 on irrigation channels varying in size from small ditches carrying a few miners' inches to large canals carrying as high as 225 second-feet, and including nearly every form of ditch common to Western America. Objects sought were to ascertain the existing condition of ditches and canals which had been in operation for a number of years, to determine the values of the coefficient of roughness under different conditions, and to ascertain the form which channels assume when acted upon by water and the atmosphere.

Annual Report, 1900, pp. 76, pls. 10.—This contains a report of the director reviewing at some length the history, organization, equipment, work, and publications of the station; a subject list of Bulletins 1–70 of the station; a financial statement for the fiscal year ended June 30, 1900; list of exchanges; and departmental reports giving outlines of investigations in horticulture, irrigation, poultry raising, chemistry, dairying, and stock feeding, together with meteorological observations and some of the results of work along different lines, including forcing and irrigating vegetables and feeding experiments with steers and sheep.

GENERAL OUTLOOK.

The administratiion that took charge of the station September 1, 1900, found that experiments which had been in progress for many years had been completed, and hence devoted much necessary time to the work of perfecting plans for new experiments and inaugurating some of them. Irrigation was wisely chosen as the central subject of

investigation. For example, the work in animal husbandry will be confined mainly to a study of the most profitable utilization of irrigated crops. Studies of orchard and garden irrigation will be made and the new vegetation house will be devoted largely to studies in irrigation. The piece of valley land purchased is more typical of the larger portion of the farming lands of Utah than that of the present station farm, and will therefore be a valuable acquisition to the station. The departments of agronomy, animal husbandry, and irrigation engineering are cooperating closely in a study of animal and plant production under conditions of irrigated agriculture. The work begun seems to be well planned and is being energetically prosecuted.

VERMONT.

Vermont Agricultural Experiment Station, *Burlington.*

Department of University of Vermont and State Agricultural College.

GOVERNING BOARD.

Board of Trustees—Board of Control: Matthew Henry Buckham (*Pres.*), *Burlington;* E. J. Ormsbee, *Brandon;* G. S. Fassett, *Enosburg;* Cassius Peck, *Burlington.*

STATION STAFF.

Matthew Henry Buckham, D. D., LL. D., *President of the University*
J. L. Hills, B. S., *Dir.*
G. H. Perkins, Ph. D., *Ent.*
L. R. Jones, Ph. B., *Bot.*
F. A. Waugh, M. S., *Hort.*
F. A. Rich, V. S., M. D., *Vet.*
Cassius Peck, *Supt. Farm.*
C. H. Jones, B. S., *Chem.*
B. O. White, Ph. B., *Asst. Chem.*
W. J. Morse, B. S., *Asst. Bot.*
E. S. Gregg, *Dairyman.*
Mary A. Benson, *Sten.*
E. H. Powell, *Treas.*

LINES OF WORK.

No change has been made during the past year in the main lines of work pursued by the Vermont Station. These have included chemical studies of potatoes, artichokes, maple sap, and fertilizers; horticultural investigations with special attention to the classification, pollination, and hybridization of plums; botanical investigations, especially on the diseases of apples, potatoes, and carrots, and on weeds, the purity of seeds, and the physiology of the flow of maple sap; entomological studies, especially on the forest tent caterpillar; and feeding experiments with dairy cows. The work in dairying is directed mainly toward the improvement of methods of experimentation in feeding milch cows. The horticulturist is continuing the work in the propagation of plums and has made some interesting experiments in combinations of stocks and grafts. The station is conducting nutrition investigations in cooperation with this Office, the special subject of investigation being farmers' dietaries. The inspection of fertilizers, feeding stuffs, and creamery glassware has been continued

as heretofore. During the year the horticulturist of the station has published two books, one on Plums and Plum Culture, the other on Fruit Harvesting, Storing, and Marketing.

INCOME.

The income of the station during the past fiscal year was as follows:

United States appropriation	$15,000.00
Fees	3,446.28
Farm products	5,542.46
Total	23,988.74

A report of the receipts and expenditures for the United States fund has been rendered in accordance with the schedules prescribed by this Department, and has been approved.

PUBLICATIONS.

The publications of this station received during the past fiscal year were Bulletins 81–86.

Bulletin 81, pp. 56.—Principles and Practice of Stock Feeding.—A popular discussion of this subject, including tables of feeding standards, the composition and digestibility of feeding materials, etc.

Bulletin 82, pp. 24.—Analyses of Commercial Feeding Stuffs.—Analyses of 375 samples of commercial feeding stuffs inspected in compliance with the State law, the chief provisions of which are given.

Bulletin 83, pp. 12, pls. 4.—Apples of the Fameuse Type.—The Fameuse apple is taken as a central type of several different varieties, and is discussed as regards history, variation, pomological status, etc., and historical and descriptive notes are given on 12 varieties belonging to the Fameuse group.

Bulletin 84, pp. 16.—Analyses of Commercial Feeding Stuffs.—Analyses of 230 samples of commercial feeding stuffs with a discussion of the results.

Bulletin 85, pp. 12, figs. 2.—Potato Scab and Its Prevention.—A popular discussion of the occurrence and appearance, cause, development and spread, and prevention of potato scab.

Bulletin 86, pp. 24.—Analyses of Commercial Fertilizers.—Analyses and valuations of samples of 40 brands of fertilizers, with tables showing the composition of the leading brands of fertilizers examined by the station during the past five years, 1896–1900.

GENERAL OUTLOOK.

Adherence to a few important lines of work continues to be the policy of the Vermont Station. Among the leading subjects of investigation are dairying, maple-sugar production, fruit production, and potato growing. For some time past, and especially during the last

year, the station has been making a very thorough and ingenious study of the flow of maple sap under varying conditions, the botanical and chemical departments cooperating in the work. A large amount of data has been collected and is being prepared for publication. The botanist has published the results of extended investigations conducted principally in the laboratory of Plant Pathology of this Department on a soft rot of carrot and other vegetables, and the horticulturist has published the results of interesting and valuable studies on the propagation and pollination of plums and on plum-tree canker. These and the work on the control of tuberculosis in cattle are considered of great practical benefit to the farmers of the State. Press bulletins and attendance at farmers' institutes have been found to be most effective means of keeping in touch with farmers. The station officers, however, especially the director, do less institute work than formerly, the responsibility for this work being more fully assumed by the State board of agriculture.

VIRGINIA.

Virginia Agricultural Experiment Station, *Blacksburg.*[a]

Department of Virginia Agricultural and Mechanical College.

GOVERNING BOARD.

Board of control: J. T. Brown, *Brierfield;* D. M. Cloyd, *Dublin;* B. R. Selden, *Richmond;* W. R. Robertson, *Plasterco;* J. M. McBryde (*Pres. College*), *Blacksburg.*

STATION STAFF.

J. M. McBryde, Ph. D., LL. D., *President of the College and Director.*

W. B. Alwood, *V. Dir.; Hort., Ent., and Myc.*
E. A. Smyth, jr., M. A., *Biol.*
D. O. Nourse, B. S., *Agr.*
R. J. Davidson, M. A., *Chem.*
H. L. Price, B. S., *Asst. Hort.*
E. P. Niles, D. V. M., *Vet.*
John Spencer, V. S., *Asst. Vet.*
J. H. Gibboney, *Asst. Chem.*
J. B. Huffard, *Asst. Chem.*

C. I. Wade, *Treas.*

LINES OF WORK.

The work of the Virginia Station during the past year has been along the same general lines as heretofore and has included feeding experiments with cattle and pigs; chemical analyses of feeding stuffs, fertilizers, varieties of apples and the pomace of these varieties; study of the problems presented in the fermentation of cider and vinegar; collection and study of foreign types of apples, with a view to supplying qualities lacking in native fruits for the production of the finer grades of ciders and vinegars; experiments with field crops, and veterinary and entomological investigations. The fermentation studies

[a] Express and freight address, *Christiansburg Depot.*

include a critical study of the alcoholic ferments and allied forms that interfere with sound processes of fermentation and of those fungi that impair the quality of alcoholic beverages; separation and study of races of yeast organisms, with regard to their power of producing strong, well-ordered fermentation and the character of flavor and bouquet produced in liquor, and a practical study in the fermentation of must of many varieties of native fruits. The work with cider is being conducted in cooperation with the Bureau of Chemistry of this Department, with which Bureau also the station is cooperating in sugar-beet investigations. A soil survey is being conducted in cooperation with the Bureau of Soils of this Department, and chemical work with soils is being done for the Association of Official Agricultural Chemists of the United States.

During the year the main barn and the piggery and abattoir (Pl. VII, fig. 1) were completed by the college. The former has stable room for 150 head of cattle and is well adapted for feeding experiments. The latter contains excellent facilities for feeding and slaughtering pigs and is built largely for experimental work. There is also a new machinery barn, which contains commodious quarters for machinery, wagons, tools, harness, etc., a carpenter shop, blacksmith shop, and a quarantine room for sick animals. The assistant chemist of the station has been granted leave of absence for two years to pursue studies in Germany. Under the provision of State laws the horticulturist continues the inspection for insect pests and the veterinarian manufactures and distributes blackleg vaccine. Members of the staff assist at farmers' institutes, which are under the management of the commissioner of agriculture.

INCOME.

The income of the station during the past fiscal year was as follows:

United States appropriation	$15,000.00
Farm products	3,994.51
Total	18,994.51

A report of the receipts and expenditures for the United States fund has been rendered in accordance with the schedules prescribed by this Department, and has been approved.

PUBLICATIONS.

The publications of this station received during the past fiscal year were Bulletins 103–110 and the Annual Report for 1900.

Bulletin 103, pp. 12, figs. 2.—Blackleg Vaccine.—A revision of Bulletin 90 of the station giving directions for the preparation and use of blackleg vaccine.

Bulletin 104, pp. 16, pl. 1.—The Prevention of Texas Cattle Fever

and the Amended Laws Controlling Contagious and Infectious Diseases.—A brief review of the experimental work done on the cattle tick and the Texas fever by the Bureau of Animal Industry of this Department and the agricultural experiment stations in Texas, Missouri, and Louisiana, and the text of the laws of Virginia for the control of infectious and contagious diseases of live stock.

Bulletin 105, pp. 8.—Steer Feeding.—Data for a test with 7 steers of the relative feeding value of whole corn and corn-and-cob meal used in combination with other foods.

Bulletin 106, pp. 20, pls. 6.—Barns.—The specifications of a wooden hillside barn erected at the station at a cost of between $6,000 and $7,000 are given in full and the plans are briefly discussed.

Bulletin 107, pp. 26.—Feeding Stuffs.—A general discussion of feeding stuffs with analyses of a number of samples.

Bulletin 108, pp. 12.—Animal Parasites, I.—A brief classification of the parasites of domestic animals according to the natural orders to which they belong.

Bulletin 109, pp. 12, pl. 1, fig. 1.—Animal Parasites, II.—Brief popular notes on the Culicidæ, with suggestions of remedies against these insects.

Bulletin 110, pp. 16, figs. 5.—Animal Parasites, III.—Brief popular notes on *Gastrophilus equi*, *G. hæmorrhoidalis*, *G. nasalis*, ox bot fly, ox warble fly, and sheep bot fly.

Annual Report, 1900, pp. 14.—This contains the organization list of the station, a report of the director consisting mainly of a summary of the bulletins issued during the year, a summary of meteorological observations, a financial statement for the fiscal year ended June 30, 1900, and brief departmental reports.

GENERAL OUTLOOK.

The Virginia Station continues to give much attention to the investigation of means for utilizing fruit products, especially those of the apple, which is one of the most important crops of the State. The chemical and horticultural departments are cooperating in this work, and their investigations, extending as they do to the study of yeasts, musts, ciders, vinegars, pulp, etc., cover more phases of the problem than are covered by any other station in this country. The station is also studying other problems in fruit growing, such as the introduction of improved varieties, management of orchards, destruction of insect pests, etc. The soil survey recently undertaken will enable the station to determine the sections of the State best adapted to apple growing and those adapted to other agricultural productions. Attention is being given also to problems in animal husbandry, especially feeding experiments with live stock, for which important additions to the college and station buildings and equipment have recently been made.

WASHINGTON.

Washington Agricultural Experiment Station, *Pullman.*

Department of Washington Agricultural College and School of Science.

GOVERNING BOARD.

Board of Regents: F. J. Barnard, *Seattle;* R. C. McCroskey, *Garfield;* H. W. Canfield, *Colfax;* J. W. Stearns (*Treas.*), *Tekoa;* H. D. Crow, *Spokane.*

STATION STAFF.

E. A. Bryan, M. A., *President of the College and Director.*

E. E. Elliott, M. S., *Agr.*
Chas. V. Piper, M. S., *Bot. and Zool.*
S. W. Fletcher, *Hort.*
Elton Fulmer, M. A., *Chem.*
Sofus B. Nelson, D. V. M., *Vet.*
H. S. Davis, *Asst. Zool.*
R. E. Snodgrass, *Asst. Ent.*
R. W. Thatcher, B. S., *Asst. Chem.*
R. Kent Beattie, M. A., *Asst. Bot.*
O. L. Waller, *Irrig. Engin.*
David A. Brodie, B. S., *Supt. Puyallup Station.*

J. S. Cotton, *In Charge of Cooperative Range Experiments.*

LINES OF WORK.

The work of the Washington Station during the past year has included experiments with grasses and forage plants for farms and for the ranges in the semi-arid belt; cultural experiments with cereals; extensive breeding experiments with wheat; rotation experiments; feeding experiments with steers, pigs, and sheep; chemical investigations with soils, sugar beets, potatoes, and wild oats; horticultural investigations, including cover crops for orchards, spraying for apple scab, potash fertilizers for fruit, smudging for protection from frost, orchard pollination, vegetable gardening, cooperative work in strawberry culture, and to determine the causes of failure of Italian prunes in Clarke County; study of diseases and insects injurious to grain, fruit, and garden vegetables; irrigation investigations; veterinary work, including an investigation of moldy hay as a supposed cause of spinal meningitis; experiments with plants poisonous to sheep, and a continuation of studies of glanders and tuberculosis, and the investigation of means for controlling or eradicating the ground squirrel. The irrigation investigations are conducted in cooperation with this Office, and the experiments with grasses and forage plants for the improvement of the Northwestern ranges in cooperation with the Bureau of Plant Industry of this Department. Work at the Puyallup Substation is being continued with State funds, but the station has withdrawn entirely from its connection with the oyster-culture station on Puget Sound.

The agriculturist has given much attention to the breeding of wheats in order to develop a fall club wheat, and has succeeded already in making some quite valuable improvements. The work at Yakima, Puyallup, and Pullman with forage plants for hay and pasture is partly carried on in cooperation with farmers and is giving a remarkable

impetus to the production of forage. Pig-feeding experiments with different grains have for the third time shown the best results for wheat, which produces a firmer and leaner meat than other grains. During the year a greenhouse and insectary, costing $1,000, has been erected, and cattle and hogs, costing over $1,000, bought with State funds. The State has also provided $25,000 for a new chemical building and equipment which will furnish better facilities for the station, $1,250 a year for two years for State veterinary work, and $500 for a contagious-disease ward. The expense of farmers' institutes is borne by communities, the transportation being furnished by the railroads. One railroad last year gave passes to over 100 farmers to visit the college and station, selecting ten farmers from a township.

INCOME.

The income of the station during the past fiscal year was as follows:

United States appropriation	$15,000.00
State appropriation	9,848.96
Miscellaneous, including fees and farm products	565.98
Total	25,414.94

A report of the receipts and expenditures for the United States fund has been rendered in accordance with the schedules prescribed by this Department, and has been approved.

PUBLICATIONS.

The publications of this station received during the past fiscal year were Bulletins 43–46 and the Annual Reports for 1899 and 1900.

Bulletin 43, pp. 48.—Rational Stock Feeding.—A revision of Bulletin 29 of the station, discussing in a popular manner the principles of stock feeding.

Bulletin 44, pp. 13.—Fish Scrap Fertilizers.—A discussion of the value and importance of dried fish and fish-scrap fertilizers.

Bulletin 45, pp. 12, fig. 1.—A Preliminary Report of Poison Parsnip in Western Washington.—An account of experiments in feeding *Cicuta vagans* to steers to determine if hay containing this plant was responsible for a case of poisoning of cows. Tests to determine if several other plants are poisonous to stock were also made.

Bulletin 46, pp. 15, pls. 4, fig. 1.—Potato Blight and Its Treatment.—A popular description of potato blight, results of spraying experiments with Bordeaux mixture for the prevention of this disease, and directions for preparing Bordeaux mixture.

Annual Report, 1900, pp. 8.—A report of the director reviewing briefly the different lines of station work, and giving a financial statement for the fiscal year ended June 30, 1900.

GENERAL OUTLOOK.

The Washington Station is doing much for the advancement of agriculture in the State, especially along lines related to the production of field crops and live stock. One need of the wheat growers is a fall-sown wheat that will not winterkill, and this the agriculturist has tried to obtain. The production of grasses and other forage crops and the improvement of the ranges are very important problems related to the development of animal production in the State, which the station is investigating. Closely related to these also are the feeding experiments and the veterinary investigations. The continued success and consequent growth of the college with which this station is connected, as well as the increasing importance of the agriculture of the State, make it very desirable that this station should have a director who can give his time and energy fully to the study and administration of the important affairs of this department of the college. It is hoped, therefore, that the offices of president of the college and director of the station will be separated in the near future.

WEST VIRGINIA.

West Virginia Agricultural Experiment Station, *Morgantown.*

Department of West Virginia University.

GOVERNING BOARD.

Board of Regents: E. M. Grant, *Morgantown;* C. E. Haworth, *Huntington;* J. W. Hale, *Princeton;* C. M. Babb, *Falls;* J. R. Trotter, *Buckhannon;* D. C. Gallaher, *Charleston;* J. B. Finley, *Parkersburg;* C. D. Oldham, *Moundsville;* W. J. W. Cowden, *Wheeling.*

STATION STAFF.

D. B. Purinton, Ph. D., LL. D., *President of the University.*

J. H. Stewart, M. A., *Dir.; Agr.*
A. D. Hopkins, Ph. D., *V. Dir.; Ent.*
Bert H. Hite, M. S., *Chem.*
K. C. Davis, Ph. D., *Hort.*
Gilbert M. John, *Asst. Hort.*
W. E. Rumsey, B. S. A., *Asst. Ent.*
C. D. Howard, H. S., *Asst. Chem.*
Frank B. Kunst, *2d Asst. Chem.*
Horace Atwood, M. S., *Asst. Agr.*
John Wallace, *Sten. and Clerk.*
M. A. Stewart, *Libr.*
W. J. White, *Auditor.*
A. R. Whitehill, Ph. D., *Treas.*

LINES OF WORK.

The work of the West Virginia Station during the past year has been along the same lines as heretofore pursued, including field experiments with cereals, forage crops, and grasses; a continuation of a comprehensive series of experiments designed to study some of the important problems in soil fertility, involving the use of commercial fertilizers, barnyard manure, green manures, and crop rotations; feeding experiments with sheep; experiments with poultry with reference to the production of meat and eggs, the study of the different feeds

for young chickens, the incubation of chickens, and the preservation of eggs; horticultural work in spraying for insects and plant diseases; experiments with new insecticides and fungicides, including a thorough study of the various crude petroleums and combinations of petroleum products for San José scale; experiments in breeding roses and carnations; forcing experiments with lettuce and other greenhouse crops; field experiments with a variety of horticultural crops, especially cranberries, on mountain glade lands of the State; fertilization of orchards; a study of causes of winterkilling in peach orchards; chemical work, including analyses of soils, commercial fertilizers, forage crops, grains, fruits, fruit juices, meats, materials used in preparations of insecticides and fungicides, mineral and drinking waters, etc.; a study of the effect of high pressure in the preservation of perishable foods; entomological work, including investigations of the Hessian fly, periodical cicada, jointworm, and insects injurious to timber and timber products.

During the year the legislature of the State amended the fertilizer law so as to bring it more nearly in accordance with modern requirements, and enacted a law providing for the inspection of nurseries and orchards, carrying with it a sufficient appropriation for the inspection, and placing the execution of the law in the hands of the director of the station. The station is continuing its soil survey with the intention of finally providing a complete soil map of the State. Special attention has been given to investigations of the periodical cicada, Hessian fly, and insects injurious to forests. The study on the effect of pressure in the preservation of perishable food stuffs has been continued with encouraging results, especially in the case of fruits and fruit juices, which it seems may be preserved in excellent condition by the application of relatively small pressures at ordinary temperature for a few days. For this work apparatus has been designed by those having the experiments in charge. A new library building for the university, which will afford better facilities for the preservation of station records, is in process of construction. During the year Dr. J. H. Raymond, president of the university, resigned, and was succeeded by Dr. D. B. Purinton, who was president of the Denison College, Ohio. L. C. Corbett, horticulturist, resigned to accept a position in this Department, and was succeeded by Dr. K. C. Davis, of Minnesota.

INCOME.

The income of the station during the past fiscal year was as follows:

United States appropriation	$15,000.00
Fees	6,062.50
Farm products	326.84
Miscellaneous	1,056.67
Total	22,446.01

A report of the receipts and expenditures for the United States fund has been rendered in accordance with the schedules prescribed by this Department, and has been approved.

PUBLICATIONS.

The publications of this station received during the past fiscal year were Bulletins 66–75 and the Annual Reports for 1899 and 1900.

Bulletin 66, pp. 40, figs. 23.—Fruit Diseases and How to Treat Them.—Descriptive notes on the more common fruit diseases with suggestions for their prevention, directions for the preparation and use of insecticides and fungicides, and a spray calendar.

Bulletin 67, pp. 18, pls. 2, map 1.—The Hessian Fly in West Virginia and How to Prevent Losses from Its Ravages.—Observations and summarized information on the life history and means of controlling the Hessian fly.

Bulletin 68, pp. 76, pls. 3, figs. 4, maps 9.—The Periodical Cicada or Seventeen-year Locust in West Virginia.—This bulletin contains a brief account of the anatomy, habits, life history, and broods of the periodical cicada; notes from correspondence relating to the distribution and extent of broods occurring within the limits of the State; maps showing the distribution of the broods which will emerge in 1901, 1902, and 1905, etc.

Bulletin 69, pp. 20, pl. 1.—Report on Examination of Wheat Stubble from Different Sections of the State.—The Jointworm in Wheat.—Results of the examination of wheat stubble from 24 counties of the State for the presence of the Hessian fly, and a brief account of the appearance, life history, and habits of the jointworm with suggestions for combating this insect.

Bulletin 70, pp. 32, pls. 8, figs. 6.—Spraying.—Experiments here reported included a test of the practical value of spraying orchards with standard fungicides and insecticides; experiments in using a combination of Bordeaux mixture and kerosene; experiments in making Bordeaux mixture by mechanical methods; a test of a combination of tobacco and kerosene emulsion as a remedy for rose bugs; and experiments in combating the San José scale with whale-oil soap, dilute kerosene in a 25 per cent mechanical mixture with water, and pure kerosene and crude petroleum in a 20 per cent mixture with water.

Bulletin 71, pp. 20, figs. 2.—Poultry Experiments.—The poultry houses recently built at the station are described, and experiments including a test of the importance of warm houses in the production of eggs, a comparison of meat meal with ground fresh meat and bone for egg production, a comparison of rations with wide and narrow nutritive ratios for growing chickens, a test of the importance of a liberal supply of green food for laying hens, and a test concerning the fertility of eggs are reported.

Bulletin 72, pp. 32.—Commercial Fertilizers.—Analyses and valuations of 287 samples of fertilizing materials examined during 1900.

Bulletin 73, pp. 16.—Poultry Experiments.—Three tests of the loss of weight in eggs during incubation are reported.

Bulletin 74, pp. 32, figs. 3.—Cold Storage.—The profits of cold storage are discussed, experiments with apples and chestnuts in cold storage are reported in detail, and chapters on "moisture in cold storage" and "materials of construction," taken from books relating to cold storage, are appended. The author outlines a plan for the building of a cold-storage room, giving methods of construction and materials used.

Bulletin 75, pp. 98, pls. 7, figs. 5, map 1.—Apple Districts of West Virginia.—Preliminary notes are given on the apple industry in West Virginia and on top-grafting old trees; and information obtained from correspondents relative to the condition of orchards after the severe frost of March 29, 1898, the areas in the State best suited to apple culture, and the relative value of 114 varieties of apples and 5 varieties of crab apples for each county of the State is presented by means of tables and maps.

Annual Report 1899, pp. 45, pls. 5, fig. 1.—A financial statement for the fiscal year ended June 30, 1899; a report of the director giving a general review of station work during the year; and departmental reports reviewing in greater detail the different lines of station work, that of the entomologist giving in addition a detailed statement of various trips made in the State for the purpose of studying forest insects and life zones, and that of the horticulturist a detailed illustrated account of an improved auxanometer and a transpiration apparatus, with some explanations as to the uses of these instruments in studies in plant physiology.

Annual Report, 1900, pp. 24.—A financial statement for the fiscal year ended June 30, 1900; a report of the director reviewing at some length the different lines of station work and summarizing briefly some of the results of investigations previously reported; a table showing the quantity and value of commercial fertilizers sold in the State during the last five years; and brief statements on the results of experiments on the effect of pressure in the preservation of perishable food stuffs and on methods of preserving eggs.

GENERAL OUTLOOK.

No branch of agriculture in West Virginia is forging ahead so rapidly as that of fruit growing. It is officially reported that during the year 1900 from 2,000 to 2,500 acres of apple orchards were planted in Berkeley County alone, while in other counties there was a large increase in the acreage of apple orchards, and many hundred thousand peach trees were set out. Station officers are working hand in hand with fruit growers for the development of this industry, the work

including cooperative experiments in the renovation of old and the establishment of new orchards, experiments in building up worn-out soils, entomological investigations, experiments with spraying materials, etc. The work is very popular and is bringing the station into cordial relations with the people of the State, as is evidenced by the recent legislation in support of orchard and nursery inspection. The investigations of the station, in cooperation with the Division of Entomology of this Department, have been of more than local importance. The experiments with field crops, fertilizers, and poultry are now well organized and are proceeding along useful lines.

WISCONSIN.

Agricultural Experiment Station of the University of Wisconsin, *Madison.*

Department of the University of Wisconsin.

GOVERNING BOARD.

Board of Regents: J. H. Stout (*Pres.*), *Menomonie;* State Superintendent of Instruction, *Madison;* President of University, *Madison;* H. C. Taylor, *Orfordville;* Edward Evans, *La Crosse;* James C. Kerwin, *Neenah;* Wm. F. Vilas, *Madison;* B. J. Stevens (*V. Pres.*), *Madison;* Almah J. Frisby, *Milwaukee;* E. A. Edmonds, *Oconto Falls;* Arthur J. Puls, *Milwaukee;* Geo. F. Merrill, *Ashland;* D. T. Parker, *Fennimore;* Arthur M. Pereles, *Milwaukee;* Maj. C. Mead, *Plymouth;* E. F. Riley (*Sec.*), *Madison.*

STATION STAFF.

E. A. Birge, Ph. D., D. Sc., *Acting President of the University.*

W. A. Henry, B. Agr., *Dir.*
S. M. Babcock, Ph. D., *Asst. Dir. and Chief Chem.*
A. R. Whitson, B. S., *Agr. Phys.*
E. S. Goff, *Hort.*
Frederic Cranefield, *Asst. in Hort.*
E. H. Farrington, M. S., *Dairy Husb.*
U. S. Baer, *Cheese Making.*
W. L. Carlyle, B. S. A., *Animal Husb.*
T. F. McConnell, jr., *Asst. Animal Husb.*
H. L. Russell, Ph. D., *Bact.*
John F. Nicholson, *Asst. Bact.*
F. W. Woll, M. S., *Chem.*
Alfred Vivian, *Asst. Chem.*
R. A. Moore, *Asst. Agr.*
F. J. Wells, *Asst. Agr. Phys.*
Leslie H. Adams, *Farm Supt.*
Ida Herfurth, *Clerk.*
Daisy G. Beecroft, *Libr. and Sten.*

LINES OF WORK.

The work of the Wisconsin Station during the past year has included a large number of feeding experiments with horses, cattle, hogs, and pigs; investigations in soil physics, including studies of muck soils and movement of nitrates in the soil; irrigation investigations; horticultural work, including studies of the plum, commercial orchard work, surface *v.* subwatering for ornamentals, and experiments in pinching raspberries; chemical and bacteriological investigations with silage; bacteriological studies of tuberculosis and anthrax; and dairy investigations, including studies and experiments with skim milk, condensed milk, and cream, and studies of a number of problems in cheese

ripening, including temperature variations from below zero to above 70° F. Variety tests of cereals have been carried on and a striking demonstration made of the value of formaldehyde for preventing oat smut. A cross between razor-back pigs and Poland Chinas has been tried. The feeding experiments have included cost of ration for colts, narrow *v.* wide ration for steers, dried *v.* cooked feeds for steers, peas *v.* corn for pigs, shelled *v.* ground corn for pigs, corn products *v.* oat products for sheep and for cows, sorghum *v.* corn fodder for cows, rape for milch cows, and salt for cows. The irrigation experiments have included, among other things, the use of water in a rotation experiment on 10 acres with corn, potatoes, and grass, and have been conducted in cooperation with this Office. The station is also cooperating with the Bureau of Chemistry of this Department in sugar-beet investigations, and with the Bureau of Plant Industry of this Department in studies of the influence of origin of red-clover seed on yield of crop. In cooperation with the breeders' association the station tests cows for farmers, to determine the amount and quality of milk produced.

The State legislature at its last session appropriated $150,000 for a new agricultural building and made an addition of $10,000 to the maintenance fund of the college. The new building will be 200 by 63 feet, four stories high, with a two-story octagon in the rear for library and auditorium, and will furnish additional facilities for both the station and the college of agriculture. This building is now in process of construction, but will not be completed before January, 1903. The legislature also passed a law placing the inspection of feeding stuffs in the hands of the station. During the year an experimental union was formed among the graduates and former students of the college, similar in object and character to the Ontario Agricultural and Experimental Union. The soil physicist of the station, Prof. F. H. King, resigned recently to accept a position in the Bureau of Soils of this Department, and the assistant soil physicist, A. R. Whitson, has been placed in charge of the department. During the past year Professor King published a text-book of the physics of agriculture.

In 1899 the Wisconsin legislature passed a joint resolution providing that a medal be presented to Dr. S. M. Babcock, chemist of the experiment station, who worked out and perfected the milk test which bears his name, and has made many other contributions of the greatest value to dairying. A committee appointed by Governor Scofield procured a medal and arranged the details for its presentation. This ceremony took place at a joint session of the senate and assembly in the State Capitol at Madison on the evening of March 27, 1901. Gov. Robert M. La Follette presided at the meeting and gave an address in which he paid high tribute to Dr. Babcock for his inventions and discoveries and for his unselfish dedication of them to the public. Ogden H. Fethers, regent of the university, made the

presentation address, to which Dr. Babcock responded. Other addresses were given by Senator W. H. Hatton, Assemblyman G. W. Gilman, Director W. A. Henry, and ex-Governor W. D. Hoard. The medal (Pl. VI, figs. 1 and 2) is of golden bronze, 5 inches in diameter. Upon the obverse are symbolical figures representing Agriculture and Science bringing their offerings to State, who sits enthroned on a raised dais. The reverse contains the preamble to the joint resolution, surrounded by an oak wreath, outside of which are the encircling words "The State of Wisconsin Presents to Professor Babcock this Medal."

INCOME.

The income of the station during the past fiscal year was as follows:

United States appropriation	$15,000.00
State appropriation	[a]15,000.00
Fees	125.00
Total	30,125.00

A report of the receipts and expenditures for the United States fund has been rendered in accordance with the schedules prescribed by this Department, and has been approved.

PUBLICATIONS.

The publications of this station received during the past fiscal year were Bulletins 84–87; Special Bulletin, March, 1901; and the Annual Report for 1900.

Bulletin 84, pp. 16, figs. 4, map 1.—Bovine Tuberculosis in Wisconsin.—A discussion of the present status of bovine tuberculosis in Wisconsin, a statistical account of the percentage of tuberculous animals in other States, and brief notes on the geographical distribution of tuberculosis in Wisconsin, the spread of the disease from herd to herd, its introduction through tuberculous animals, the advisability of State quarantine, mode of dissemination within a herd, and methods of treating reacting animals and controlling the disease.

Bulletin 85, pp. 48, pl. 1, figs. 10.—Development and Distribution of Nitrates and Other Soluble Salts in Cultivated Soils.—This is in large part a reprint from the report of the station for 1900, with more detailed data, of an account of investigations of the amount of nitric nitrogen in field soils under crop conditions throughout the season, but contains also accounts not previously reported of investigations on the limit of nitric nitrogen in field soil at which the leaves of corn and oats turn yellow, difference between the amounts of nitric nitrogen under growing crops and in cultivated fallow ground at the same time, distribution of nitrates and other soluble salts in soil under growing

[a] Estimated amount of State appropriation for the college of agriculture and experiment station spent for experimental purposes.

FIG. 1.—WISCONSIN STATION—BABCOCK MEDAL, OBVERSE.

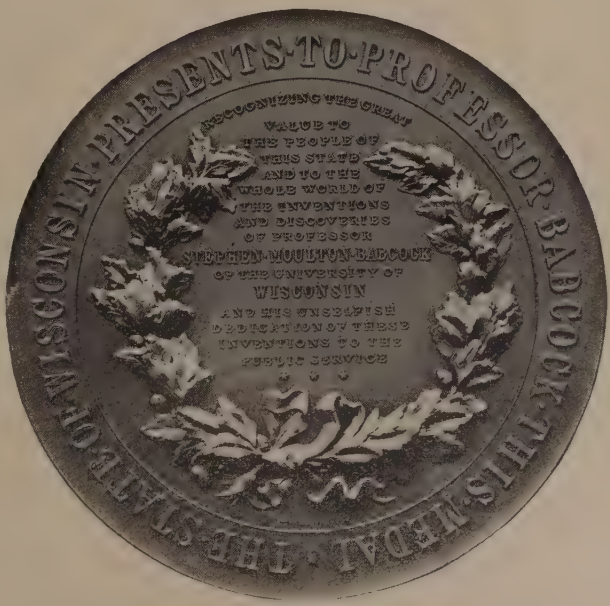

FIG. 2.—WISCONSIN STATION—BABCOCK MEDAL, REVERSE.

corn as it comes into full tassel, the strength of salt solutions under field crops, results of Warington's nitric nitrogen studies at Rothamsted, method of determining soluble salts and nitric nitrogen in field soils, sensitiveness of the methods used in the study of nitric nitrogen and soluble salts, and possible error in results due to the methods.

Bulletin 86, pp. 10.—Analyses of Licensed Commercial Fertilizers, 1901.—The text of the Wisconsin fertilizer law, notes on the sources of fertilizing ingredients in fertilizers and on the valuation of fertilizers, and analyses of 5 samples of fertilizers sold in the State during the year.

Bulletin 87, pp. 31, pls. 4, figs. 8.—Native Plums.—This bulletin considers the following topics: Methods of plum culture, culinary uses of native plums, varieties, blooming period of plums, thickness of the skins, and the longevity of American plums. Some data are also presented on the self-fertility or sterility of native plums.

Special Bulletin, March 1901, pp. 4, fig. 1.—The Prevention of Oat Smut.—A popular description of oat smut and methods of prevention.

Annual Report, 1900, pp. 360, pls. 14, figs. 63, maps 2.—In addition to a report of the director on the work and publications of the station during the year, lists of exchanges and acknowledgments, and a financial statement for the fiscal year ended June 30, 1900, the following work is reported in greater or less detail: A comparison of whole corn and corn meal, made with 2 lots of 14 pigs each; a preliminary experiment with 16 pigs in regard to the effect of certain foods on the production of lean meat; a test, with 30 pigs, of the feeding value of rape; tests, with 47 breeding ewes, to compare different rations for winter feeding, especially to determine the value of corn fodder and silage; an experiment with 16 cows, lasting twelve weeks, to study the proportion of grain feed to coarse fodder best adapted for the economical production of milk and butter; official tests of 110 Holstein, 7 Guernsey, 2 Shorthorn, and 8 Red Polled cows; investigations of the cause of error in some incorrect tests with turbine Babcock testers, the effect of temperature on tests of skim milk by the Babcock test, and the determination of fat in sweetened condensed milk by the Babcock test; the calculation of dividends for milk and cream at the same factory; tests of a patent churn in comparison with a barrel churn; a description and tests of a method for the determination of salt in butter designed for factory use; investigations to determine the effect of different quantities of rennet in cheese ripening; experiments in making silage under laboratory conditions for the purpose of studying the changes which occur in the formation of good silage; a description of a form of apparatus devised at the station for conducting experiments in the respiration of vegetable tissues, particularly for the study of the phenomena attending the production of heat in silage; investigations, under commercial conditions, conducted for the purpose of retest-

ing some of the more recent work in regard to the thermal death point of tubercle bacilli; investigations of an outbreak of anthrax traceable to tannery refuse, and experiments to test the value of formaldehyde in destroying the anthrax bacillus; a study of the influence of the right amount and the right distribution of water in crop production, including culture and irrigation experiments; a series of experiments to determine the extent and character of unavoidable losses in the production of silage; tests of the relative effectiveness of various potash salts on black-marsh soils; studies of the influence of tillage, season, and cropping on the total amounts, relative proportions, and distribution of nitric nitrogen and soluable salts in soils; data for tests of 35 varieties of oats, 15 of barley, 10 of spring wheat, 6 of peas, 2 of spelt, and 1 of spring rye; analyses of sugar beets, and variety and fertilizer tests; analyses of 7 samples of commercial fertilizers; tables for use in Kjeldahl method for determination of nitrogen; investigations on the origin and development of flower buds, especially those of the peach and strawberry; experiments in pinching raspberry shoots; observations on the resumption of root growth in the spring; experiments to study the effects of using immature seed corn and tomato seed; studies on duration of the growth period in fruit trees; a description of rooms for cheese making and curing recently provided at the station; a record of the university dairy herd, kept partly for the purpose of comparing the milk and butter production of cows of the special-purpose dairy type and cows of the dual-purpose type; and the text of the Wisconsin fertilizer law.

GENERAL OUTLOOK.

The Wisconsin Station has only recently inaugurated experiments in agronomy, and at present is confining this work largely to cereals and forage plants. Important investigations regarding the composition and treatment of muck soils have been continued. An interesting feeding experiment with cows was conducted indicating that the constituents in different crops have a different effect on the animal. Long-continued feeding of salt to cows showed a marked beneficial effect. The feeding value of sorghum for cows was found to be better than that of corn fodder, and mature rape fed to cows in quantities as large as 40 to 60 pounds per day did not perceptibly affect the flavor of the milk. Investigations with succulent green corn *v.* mature corn for silage have shown that a sweeter silage is obtained from mature corn. In the cheese-ripening studies about 100 cheeses were cured at temperatures varying from below zero to above 70° F. The results show the great advantages of low-temperature curing in point of safety and greater control of the process, and demonstrate conclusively that cheese of excellent quality can be produced under such conditions of curing. The most notable result of the work of the past year has

been the discovery of the fate of the sugar in the process of cheese making and ripening. The transformed sugar has been traced and accounted for, showing the relation between the amount of sugar used and the quality of the cheese. This discovery goes a long way toward explaining some of the purely empirical rules of cheese making.

The Wisconsin College of Agriculture continues to concentrate the efforts of its strongest men on a few important lines of investigation in the experiment station, with results that fully justify the policy. That these results are appreciated in the State is evidenced by the liberal appropriations made by the legislature during the year for buildings and maintenance, by the graceful tribute to the chemist of the station in awarding him a medal for his inventions and discoveries, and by the very large and growing correspondence with farmers representing all phases of agricultural practice in the State. The short courses in the college continue to be well patronized, and a movement has been inaugurated for extending the influence of both college and station by means of an experimental union of students organized to conduct cooperative experiments.

WYOMING.

Wyoming Agricultural Experiment Station, *Laramie.*

Department of the University of Wyoming.

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STATION STAFF.

E. E. Smiley, D. D., *President of the University and Director.*

Frank E. Emery, M. S. A., *V. Dir.; Agr. and Hort.*
Aven Nelson, M. S., M. A., *Bot.*
E. E. Slosson, M. S., *Chem.*
W. C. Knight, M. A., Ph. D., *Geol.*
C. B. Ridgaway, M. A., *Phys. and Math.*
Grace R. Hebard, M. A., Ph. D., *Sec.*
Burton P. Fleming, B. S., *Irrig.*
Elias E. Nelson, M. A., *Hort. and Agros.*

LINES OF WORK.

The work of the Wyoming Station during the past year has included irrigation and alkali investigations, especially measurements of water, the duty of water with different crops, the effect of irrigation on alkali in the soil, experiments with economic plants on alkali soils, and a study of evaporation from soils containing different amounts of alkali; rotation experiments, continuous cropping, and cropping with and without summer cultivation; experiments with alfalfa as a soil renovator; variety tests with oats and wheat; smut and cultural experi-

ments with oats; experiments with cultivated and native forage plants; horticultural investigations with native and other fruits and garden vegetables; feeding experiments with pigs and lambs. The station is cooperating with this Office in irrigation investigations and with the Bureau of Plant Industry of this Department in plant breeding and quite extensive investigations of grasses and forage plants for alkali soils.

The experiments in feeding pigs included the use of alfalfa for growing pigs and of artichokes for fattening them; but it was found that too large a percentage of costly grain was needed for economical pork production. During the winter an experiment in feeding lambs was carried to successful conclusion. In another experiment the feeding qualities of capons and cockerels were compared. Early in the year a number of greenhouse experiments were started, but these were entirely destroyed by a fire which burned part of the greenhouse. However, the building has been repaired and a new potting house has been erected. The new $35,000 Science Hall (Pl. VII, fig. 2), which is just being completed, will furnish much better facilities for a number of departments of station work, especially those of chemistry and geology. The station does not carry on any institute work, but the agriculturist and botanist have delivered addresses at conventions of stockmen. The publication of press bulletins has been started.

INCOME.

The income of the station during the past fiscal year was as follows:

United States appropriation	$15,000.00
Farm products	528.20
Total	15,528.20

A report of the receipts and expenditures for the United States fund has been rendered in accordance with the schedules prescribed by this Department, and has been approved.

PUBLICATIONS.

The publications of this station received during the past fiscal year were Bulletin 45 and the Annual Report for 1900.

Bulletin 45, pp. 148, pls. 26, map 1.—A Preliminary Report on the Artesian Basins of Wyoming.—This is a preliminary treatise on the geology and artesian basins of Wyoming, based upon field notes collected during the past four years, accompanied by a map embodying "all that is known of the geology of Wyoming up to date," the object of the publication being to explain the essential features of the artesian basins of the State, so that artesian wells may be located.

Annual Report, 1900, pp. 457, pls. 39, figs. 12, dgm. 1, map 1.—This includes notes on the origin and purpose of the station; brief abstracts

FIG. 1.—VIRGINIA COLLEGE AND STATION—BARNS AND PADDOCKS.

FIG. 2.—WYOMING COLLEGE AND STATION—SCIENCE HALL.

of the bulletins issued during the year; plans of station work for 1900–1901; reports of the director and heads of departments; a financial statement for the fiscal year ended June 30, 1900; studies of the effect of alkali on the germination and growth of plants, the rate of absorption of salts from solution, and the evaporation of water from salt solutions and plants; determinations of the amount of alkali in the soil at depths of from 3 inches to 3 feet on different parts of the experiment farm; measurements of the duty of water in irrigation; observations during 1899 on the amount of water necessary to produce a maximum crop, and the results of tests of two subirrigation systems at the station; a report on tests of a large number of cultivated and native forage plants; tabulated data for tests of some 500 varieties of wheat, 60 of oats, and 50 of barley; a list with descriptive notes of species of cryptogams collected in Wyoming; meteorological observations; and reprints of Bulletins 41–45 of the station.

GENERAL OUTLOOK.

Animal industry stands at the head of agricultural industries in Wyoming, and the station is planning its work so as to eventually give this branch of agriculture a leading place in its investigations. As yet the station funds are too limited to permit the purchase of live stock needed for investigations, but feeding experiments in cooperation with private persons have been started, and other closely related investigations in irrigation and forage production are being carried on with a view to preparing the way for useful experiments with live stock when funds are provided for its purchase. The station is working earnestly along such lines as its limited funds will permit, and is coming into closer relations with the agricultural and especially the live-stock interests of the State. The carrying on of important investigations with live stock, under the conditions existing in this State, will require considerable additional funds and it is hoped that the State will be able to supplement the national funds for this purpose in the near future. The station should also be put in such financial condition that it can have a director as a separate officer.

STATISTICS OF THE AGRICULTURAL EXPERIMENT STATIONS.

TABLE 1.—*General statistics, 1901.*

Station.	Location.	Director.	Date of original organization.	Date of organization under Hatch Act.	Number on staff.	Number of teachers on staff.	Number of persons on staff who assist at farmers' institutes.	Publications during fiscal year 1900–1901.		Number of addresses on mailing list.	Principal lines of work.
								No.	Pages.		
Alabama (College)	Auburn	P. H. Mell	Feb. —, 1883	Feb. 24, 1888	13	7	9	7	253	9,200	Botany; soils; analyses of fertilizers and food materials; field and pot experiments; horticulture; diseases of plants; feeding experiments; diseases of animals.
Alabama (Canebrake)	Uniontown	J. M. Richeson	Jan. 1, 1886	Apr. 1, 1888	3	2	.....	.....	.....	2,300	Soil improvement; field experiments; horticulture; floriculture; diseases of plants; diseases of animals.
Alabama (Tuskegee)	Tuskegee	G. W. Carver	Feb. 15, 1897	.....	10	6	9	7	66	1,500	Field experiments and feeding experiments.
Arizona	Tucson	R. H. Forbes	.....	1889	8	2	4	19	118	4,800	Chemistry; botany; field experiments; improvement of ranges; horticulture, including date-palm culture; feeding experiments.
Arkansas	Fayetteville	R. L. Bennett	.....	1887	6	2	.....	6	228	6,000	Chemistry of foods; field experiments; horticulture; diseases of plants; feeding experiments; diseases of animals.
California	Berkeley	E. W. Hilgard	1875	Mar. —, 1888	22	12	9	6	459	8,100	Physics; chemistry and geographical distribution of soils; bacteriology; fertilizers; field crops; horticulture; botany; meteorology; technology of wine and olive oil, including zymology; beet-sugar chemistry; chemistry of foods and feeding stuffs; animal husbandry; entomology; dairying; drainage and irrigation; reclamation of alkali lands; plant introduction.
Colorado	Fort Collins	L. G. Carpenter	1879	Feb. —, 1888	16	8	7	32	422	7,800	Chemistry; field experiments; horticulture; entomology; irrigation.
Connecticut (State)	New Haven	E. H. Jenkins	Oct. 1, 1875	May 18, 1887	15	.....	4	4	564	10,253	Analysis and inspection of fertilizers, foods, and feeding stuffs; chemistry; diseases of plants; horticulture; forestry; field experiments; entomology.

Connecticut (Storrs)	Storrs	W. O. Atwater		do	7	2	2	2	244	7,000	Food and nutrition of man and animals; bacteriology of dairy products; field experiments; dairying.
Delaware	Newark	A. T. Neale		Feb. 21, 1888	7	7	7	9	364	7,119	Chemistry; bacteriology; field experiments; horticulture; diseases of plants; feeding experiments; diseases of animals; entomology; dairying.
Florida	Lake City	T. H. Taliaferro		1888	12	5	4	4	242	4,000	Chemistry; field experiments; horticulture; entomology.
Georgia	Experiment	R. J. Redding	Feb. 18, 1888	July 1, 1889	8	1	.....	6	264	9,000	Field experiments; horticulture; entomology; mycology; pig feeding; dairying.
Idaho	Moscow	J. A. McLean		Feb. 26, 1892	11	9	6	6	131	3,500	Physics; botany; field experiments; horticulture; entomology; feeding experiments.
Illinois	Urbana	E. Davenport		Mar. 21, 1888	25	14	12	6	244	18,000	Chemistry; bacteriology; field experiments; horticulture; forestry; diseases of plants; feeding experiments; entomology; dairying.
Indiana	Lafayette	C. S. Plumb	1885	Jan. —, 1888	11	7	9	13	202	7,500	Chemistry; pot and field experiments; horticulture; feeding experiments; diseases of plants and animals.
Iowa	Ames	C. F. Curtiss		Feb. 17, 1888	18	13	6	7	432	20,000	Chemistry; bacteriology; field experiments; horticulture; diseases of plants; feeding experiments; entomology; dairying.
Kansas	Manhattan	J. T. Willard		Feb. 8, 1888	14	12	13	34	340	21,158	Soils; horticulture; seed breeding; field experiments; feeding and digestion experiments; diseases of animals; entomology; dairying.
Kentucky	Lexington	M. A. Scovell	Sept. —, 1885	Apr. —, 1888	16	1	5	6	275	7,700	Chemistry; soils; fertilizer analysis; field experiments; horticulture; diseases of plants; entomology; dairying.
Louisiana (Sugar)	New Orleans	W. C. Stubbs	Sept. —, 1885	.....	23	5	5	5	304	15,000	Chemistry; bacteriology; soils and soil physics; field experiments; horticulture; sugar making; drainage; irrigation.
Louisiana (State)	Baton Rouge	do	Apr. —, 1886	.....							Chemistry; geology; botany; bacteriology; soils; inspection of fertilizers and Paris green; field experiments; horticulture; diseases of animals; entomology.
Louisiana (North)	Calhoun	do	May —, 1887	.....							Chemistry; soils; fertilizers; field experiments; horticulture; feeding experiments; stock raising; dairying.
Maine	Orono	C. D. Woods	Mar. —, 1885	Oct. 1, 1887	13	6	3	11	428	11,000	Chemistry; botany; analysis and inspection of fertilizers, concentrated commercial feeding stuffs, and creamery glassware; horticulture; diseases of plants; seed tests; food and nutrition of man and animals; poultry raising; marine invertebrates; diseases of animals; entomology; dairying.

TABLE 1.—*General statistics, 1901*—Continued.

Station.	Location.	Director.	Date of original organization.	Date of organization under Hatch Act.	Number on staff.	Number of teachers on staff.	Number of persons on staff who assist at farmers' institutes.	Publications during fiscal year 1900–1901.		Number of addresses on mailing list.	Principal lines of work.
								No.	Pages.		
Maryland	College Park	H. J. Patterson	1888	Apr. —, 1888	15	7	5	10	230	10,500	Chemistry; soils; field experiments; horticulture; diseases of plants; feeding experiments; entomology.
Massachusetts	Amherst	H. H. Goodell	*1882	Mar. 2, 1888	19	8	6	21	385	16,500	Chemistry; meteorology; analysis and inspection of fertilizers and concentrated commercial feeding stuffs; field experiments; horticulture; electro-germination; diseases of plants; digestion and feeding experiments; diseases of animals; entomology; dairying.
Michigan	Agricultural College.	C. D. Smith		Feb. 26, 1888	14	6	9	9	244	30,000	Bacteriology; soils; field experiments; horticulture; diseases of plants; feeding experiments; diseases of animals; entomology; apiculture; stable hygiene.
Minnesota	St. Anthony Park, St. Paul.	W. M. Liggett	Mar. 7, 1885	1888	13	7	.....	4	360	12,500	Chemistry; soils; field experiments; horticulture; forestry; diseases of plants; food and nutrition of man; plant and animal breeding; feeding experiments; diseases of animals; entomology; dairying.
Mississippi	Agricultural College.	W. L. Hutchinson		Jan. 27, 1888	10	6	7	5	122	15,000	Soils; fertilizers; field experiments; horticulture; animal husbandry; feeding experiments; diseases of animals; entomology; dairying.
Missouri (State)	Columbia	H. J. Waters		Jan. —, 1888	12	6	4	.....	.....	12,500	Chemistry; field experiments; horticulture; diseases of plants; feeding experiments; diseases of animals; entomology; dairying; drainage.
Missouri (Fruit)	Mountain Grove	J. T. Stinson	Feb. 1, 1900		3	.....	2	1	22	2,000	Horticulture.
Montana	Bozeman	S. Fortier		July 1, 1893	9	5	5	7	252	5,345	Chemistry; meteorology; field experiments; horticulture; feeding experiments; poultry experiments; entomology; irrigation.
Nebraska	Lincoln	E. A. Burnett	Dec. 16, 1884	June 13, 1887	18	11	5	6	134	18,500	Chemistry; botany; meteorology; soils; field experiments; horticulture; forestry; feeding and breeding experi-

											ments; diseases of animals; entomology; irrigation.
Nevada	Reno	J. E. Stubbs			9	6	6	6	70	2,100	Chemistry; botany; soils; field experiments; horticulture; forestry; feeding experiments; animal diseases; entomology; irrigation.
New Hampshire	Durham	W. D. Gibbs	1886	Aug. 4, 1887	11	10	7	10	275	10,000	Chemistry; bacteriology; soil physics; field experiments; horticulture; diseases of plants; feeding experiments; entomology.
New Jersey (State)	New Brunswick	E. B. Voorhees	Mar. 10, 1880		11	1	3	5	465	10,000	Chemistry; biology; botany; analysis of fertilizers, foods, and commercial feeding stuffs; pot and field experiments; horticulture; diseases of plants; food and nutrition of man; diseases of animals; entomology; dairy husbandry; bacteria of milk; irrigation.
New Jersey (College)	do	do	do	Apr. 26, 1888	8	4	3	6	355		
New Mexico	Mesilla Park	Luther Foster		Dec. 14, 1889	9	6	.....	7	231	3,500	Chemistry; soil physics; field experiments; horticulture; entomology; irrigation.
New York (State)	Geneva	W. H. Jordan	Mar. —, 1882		26	.....	10	22	958	40,000	Chemistry; bacteriology; meteorology; fertilizers; analysis and control of fertilizers; inspection of creamery glassware; field experiments; horticulture; diseases of plants; feeding experiments; poultry experiments; entomology; dairying; irrigation.
New York (Cornell)	Ithaca	I. P. Roberts	1879	Apr. —, 1888	18	7	4	12	518	20,000	Chemistry of soils, feeding stuffs and dairy products; soils; fertilizers; field experiments; horticulture; diseases of plants; feeding sheep and swine; diseases of animals; poultry experiments; entomology; dairying.
North Carolina	Raleigh	B. W. Kilgore	Mar. 12, 1877	Mar. 7, 1887	14	5	4	9	131	16,000	Chemistry; soils; field experiments; horticulture; analysis of feeding stuffs; digestion experiments; animal husbandry; diseases of animals; poultry experiments.
North Dakota	Agricultural College.	J. H. Worst		Mar. —, 1890	8	5	5	5	442	8,400	Field experiments; plant breeding; horticulture; diseases of plants; feeding experiments; diseases of animals; dairying.
Ohio	Wooster	C. E. Thorne	Apr. 25, 1882	Apr. 2, 1888	16	.....	4	7	245	38,000	Soils; field experiments; horticulture; diseases of plants; breeding and feeding experiments; diseases of animals; entomology.
Oklahoma	Stillwater	John Fields		Dec. 25, 1890	9	4	5	5	269	18,785	Field experiments; horticulture; forestry; diseases of plants; digestion and feeding experiments; animal husbandry; diseases of animals; entomology.

* In 1882 the State organized a station here and maintained it until June 18, 1895, when it became a part of the Hatch Station at the same place.

TABLE 1.—*General statistics, 1901*—Continued.

Station.	Location.	Director.	Date of original organization.	Date of organization under Hatch Act.	Number on staff.	Number of teachers on staff.	Number of persons on staff who assist at farmers' institutes.	Publications during fiscal year 1900–1901.		Number of addresses on mailing list.	Principal lines of work.
								No.	Pages.		
Oregon	Corvallis	J. Withycombe		July —, 1888	11	7	5	6	159	4,250	Chemistry; soils; field crops; horticulture; diseases of plants; digestion and feeding experiments; entomology; dairying.
Pennsylvania	State College	H. P. Armsby		June 30, 1887	17	7	5	4	32	11,500	Chemistry; meteorology; fertilizer analysis; field experiments; feeding experiments; dairying.
Rhode Island	Kingston	H. J. Wheeler		July 30, 1888	10	6		10	389	9,000	Chemistry; meteorology; soils; analysis and inspection of fertilizers and feeding stuffs; field and pot experiments; horticulture; poultry experiments.
South Carolina	Clemson College	H. S. Hartzog		Jan. —, 1888	15	7	7	11	201	9,000	Soils; analysis and control of fertilizers; field experiments; horticulture; plant breeding; diseases of plants; feeding experiments; veterinary science; entomology; dairying.
South Dakota	Brookings	J. W. Heston		Mar. 13, 1887	12	6		4	206	9,005	Bacteriology; chemistry of soils and soil physics; field experiments; forestry; plant breeding; diseases of plants; feeding experiments; entomology; irrigation.
Tennessee	Knoxville	A. M. Soule	June 8, 1882	Aug. 4, 1887	11	11	5	5	144	9,500	Chemistry; soils; fertilizers; field experiments; horticulture; seeds; weeds; diseases of plants; feeding experiments; entomology; dairying.
Texas	College Station	J. H. Connell			14	5	6	5	150	13,875	Chemistry; soils; field experiments; horticulture; diseases of animals; irrigation.
Utah	Logan	J. A. Widtsoe		1890	14	9	7	5	276	3,900	Chemistry of soils and feeding stuffs; alkali soil investigations; meteorology; field experiments; horticulture; diseases of plants; cattle and sheep breeding; feeding experiments; dairying; poultry experiments; irrigation.

Vermont	Burlington	J. L. Hills	Nov. 24, 1886	Feb. 28, 1888	12	6	3	8	504	9,700	Chemistry; analysis and control of fertilizers and feeding stuffs; inspection of creamery glassware; field experiments; horticulture; diseases of plants; feeding experiments; dairying.
Virginia	Blacksburg	J. M. McBryde	1888	1891	11	5	5	10	191	9,000	Field crops; horticulture; feeding experiments; veterinary science; entomology; cider and vinegar making; ferments.
Washington	Pullman	E. A. Bryan		1891	10	7	6	6	106	5,000	Chemistry; botany; bacteriology; soils; field experiments; horticulture; diseases of plants; feeding and breeding experiments; oyster culture; diseases of animals; entomology; dairying; irrigation.
West Virginia	Morgantown	J. H. Stewart		June 11, 1888	13	4	5	11	396	7,048	Chemistry; analysis and control of fertilizers; soils; field experiments; horticulture; inspection of orchards and nurseries; feeding experiments; poultry experiments; entomology.
Wisconsin	Madison	W. A. Henry	1883	1887	19	14	20	8	465	12,000	Chemistry; soils; field experiments; horticulture; feeding experiments; dairying; drainage and irrigation.
Wyoming	Laramie	E. E. Smiley	1887	Mar. 1, 1891	9	6	6	5	600	3,800	Geology; botany; meteorology; waters; soils; fertilizers; field experiments; food analysis; feeding experiments; entomology; irrigation.
Total					688	325	288	445	15,107	587,138	

TABLE 2.—*Revenue and additions to equipment in 1901.*

Station.	Hatch fund.	State.	Individuals and communities.	Fees.	Farm products.	Miscellaneous.	Total.	Additions to equipment in 1901.					
								Buildings.	Library.	Apparatus.	Farm implements.	Live stock.	Miscellaneous.	Total.
Alabama (College)	$15,000.00			$8,741.95	$895.37		$24,637.32	$530.51	$500.00	$864.97	$142.08	$44.61	$1,034.02	$3,116.19
Alabama (Canebrake)		$2,500.00			370.36	$1,535.87	4,406.23	224.18	3.50		16.18			243.86
Alabama (Tuskegee)		1,500.00					1,500.00							
Arizona	15,000.00				779.06	322.10	16,101.16	178.65	87.77	263.52	531.11	115.90		1,176.95
Arkansas	15,000.00				1,007.28		16,007.28	122.86	52.18		28.20	132.45		335.69
California	15,000.00	11,543.00			54.79		26,597.79	29.20	269.68	41.50	684.25		32.71	1,057.34
Colorado	15,000.00				1,280.10	624.34	16,904.44	50.49	37.74	433.94	33.65	39.50	441.78	1,037.10
Connecticut (State)	7,500.00	12,500.00	$1,580.59	7,730.40	911.85	139.91	30,362.75		539.88	59.18			716.67	1,315.73
Connecticut (Storrs)	7,500.00	1,800.00			115.70	12.50	9,428.20	9.15		495.15		25.15	86.90	616.35
Delaware	15,000.00						15,000.00	106.05	593.00	460.58	25.80	16.51	1,230.89	2,432.83
Florida	15,000.00				863.67		15,863.67	725.00	83.40	486.76	312.27	846.42		2,453.85
Georgia	15,000.00	750.00			2,361.48	2,935.71	21,047.19	1,030.00			50.00	50.00		1,130.00
Idaho	15,000.00				1,500.00		16,500.00	1,025.00	73.59	119.93	113.06	756.15		2,087.73
Illinois	15,000.00			350.00	344.93	663.46	16,358.39	125.17	382.31	196.64	1,136.27	135.01	338.50	2,313.90
Indiana	15,000.00				2,032.67		17,032.67		93.92	37.90	422.11	53.10		607.03
Iowa	15,000.00			5.00	2,951.41	115.54	18,072.05	93.68	15.62	539.39	243.47	534.85	109.13	1,536.14
Kansas	15,000.00				5,345.21	610.69	20,955.90		174.21	450.00	105.00		150.00	879.21
Kentucky	15,000.00	[a]3,123.87		[a]33,054.29	[a]4,372.31	[a]110.76	55,661.23	3,238.73	746.45	220.25	666.39	1,053.68	14,199.30	20,124.80
Louisiana	15,000.00	18,000.00		2,350.03	1,481.73	9,435.75	46,267.51	709.77	227.28	44.90	558.67	282.20	1,344.20	3,167.02
Maine	15,000.00			[b]4,526.10	2,714.36	103.62	22,344.08	1,100.89	141.15	291.83	160.48	217.20		1,911.55
Maryland	15,000.00				4,440.08	98.72	19,538.80	263.97	130.22	68.70	381.78	245.00		1,089.67
Massachusetts	15,000.00	11,200.00		3,490.25	2,091.08	2,050.50	33,831.83		221.31	5.49		20.25	75.59	322.64
Michigan	15,000.00	4,507.29		1,960.00	1,516.07	733.54	23,716.90	15,000.00	332.54	720.20	35.71	1,259.41		17,347.86
Minnesota	15,000.00	[c]35,956.32			[b]7,246.14		58,202.46		13.16		207.69	4,333.17		4,554.02
Mississippi	15,000.00				632.74	924.24	16,556.98				300.00	300.00	200.00	800.00
Missouri (State)	15,000.00			1,373.30	2,676.99	2,731.40	21,781.69		150.00	300.00	35.00	1,100.00		1,585.00
Missouri (Fruit)		26,525.00					26,525.00	10,000.00	400.00	500.00	550.00	300.00		11,750.00
Montana	15,000.00	200.00			3,549.04		18,749.04	320.68	116.25	277.18	422.10	150.00		1,286.21
Nebraska	15,000.00				1,205.77	689.01	16,894.78	574.16	226.66	442.26	201.28	66.75	514.84	2,025.95
Nevada	15,000.00				430.65	572.88	16,003.53	560.00	120.30	428.49	113.00		674.52	1,896.31
New Hampshire	15,000.00			483.36			15,483.36	175.59	196.95	72.86	45.40			490.80
New Jersey (State)		19,000.00					19,000.00		107.24	254.04		200.00	873.72	1,435.00
New Jersey (College)	15,000.00						15,000.00	279.49	660.16	426.62	7.75	35.00	177.99	1,587.01
New Mexico	15,000.00			5.30	466.51		15,471.81	750.00	80.15	287.07	756.22	281.20	356.83	2,511.47
New York (State)	1,500.00	87,119.82					88,619.82	11,500.00	690.21	151.50	200.00			12,541.71
New York (Cornell)	13,500.00	[d]12,131.69			[a]397.87		26,029.56		66.79	248.86	21.58	19.50	106.33	463.06
North Carolina	15,000.00				434.01	262.38	15,696.39	528.09	620.26	350.00	212.56	261.35		1,972.26
North Dakota	15,000.00				1,317.04	598.00	16,915.04	14,000.00	15,000.00	360.00	750.00		500.00	30,610.00
Ohio	15,000.00	13,600.00		263.64	6,560.23	15,191.30	50,615.17	4,494.04	467.90	167.47	48.80	659.05	224.62	6,061.88
Oklahoma	15,000.00				[a]2,924.84		17,924.84	1,142.63	134.38	30.07	334.88	450.00	338.00	2,429.96
Oregon	15,000.00				[a]3,044.02		18,044.02	207.90	194.89	212.08	244.59	428.45		1,287.91

Pennsylvania	15,000.00			8,355.00	4,723.97	95.46	28,174.43	191.93	218.15	1,613.92	54.40	110.00	42.25	2,230.65
Rhode Island	15,000.00				668.45	208.96	15,777.41	77.99	500.75	209.31	100.00	46.05	53.16	987.26
South Carolina	15,000.00				783.26		15,783.26	668.38	268.03	565.67	81.93	67.30		1,651.31
South Dakota	15,000.00	1,000.00			817.74	500.00	17,317.74				415.65			415.65
Tennessee	15,000.00				3,709.11		18,709.11	388.33	193.64	182.16	499.47	850.00	1.25	2,114.85
Texas	15,000.00	2,500.00				691.47	18,191.47	420.47	195.36	436.09	306.03		423.63	1,781.58
Utah	15,000.00				[a]4,054.08	727.77	19,781.85	295.24	60.44	136.50	338.16	248.45	131.32	1,210.11
Vermont	15,000.00			3,446.28	5,542.46		23,988.74	737.70	158.31	170.54	235.92	953.00		2,255.47
Virginia	15,000.00				3,994.51		18,994.51			240.00		50.00		290.00
Washington	15,000.00	9,848.96				565.98	25,414.94	56,403.00	1.67	787.46	270.08	181.05	399.20	58,042.46
West Virginia	15,000.00			6,062.50	326.84	1,056.67	22,446.01	1,741.85	275.15	53.09	51.52	465.08		2,586.69
Wisconsin	15,000.00	[c]15,000.00		125.00			30,125.00	2,800.00	371.12	334.16	405.58	570.00		4,480.86
Wyoming	15,000.00				528.20		15,528.20	600.00	109.82	271.25	229.38	267.50	247.75	1,725.70
Total	720,000.00	290,305.95	1,580.59	82,322.40	93,363.98	44,308.63	1,231,881.55	133,420.77	26,303.49	15,309.48	13,085.45	18,220.29	25,025.10	231,364.58

[a] Including balance. [b] For calendar year 1900. [c] Including subexperiment farms. [d] Estimated amount of State appropriation spent for experimental purposes.
[e] Estimated amount of State appropriation for the college of agriculture and experiment station spent for experimental purposes.

TABLE 3.—*Expenditures from United States appropriation for year ended June 30, 1901.*[a]

Station.	Amount.	Itemized.																		
		Salaries.	Labor.	Publications.	Postage and stationery.	Freight and express.	Heat, light, and water.	Chemical supplies.	Seeds, plants, and sundry supplies.	Fertilizers.	Feeding stuffs.	Library.	Tools, implements, and machinery.	Furniture and fixtures.	Scientific apparatus.	Live stock.	Traveling expenses.	Contingent expenses.	Building and repairs.	Balance.
Alabama	$15,000.00	$9,072.35	$1,266.49	$1,138.39	.....	$346.61	$216.44	$584.95	$870.41	$315.80	$215.56	$500.00	$142.08	.....	$177.52	$44.11	$95.29	$14.00	.....	.....
Arizona	15,000.00	7,527.55	3,556.10	797.16	$211.57	244.24	107.05	173.04	220.72	309.69	121.13	2.84	480.22	$49.20	202.07	8.45	548.40	22.50	$418.07	.....
Arkansas	15,000.00	9,903.80	1,533.14	628.05	204.79	138.22	30.13	118.71	990.89	.....	57.54	52.18	28.20	50.65	.....	132.45	649.35	93.00	388.90	.....
California	15,000.00	7,318.26	4,598.82	118.68	193.55	145.03	244.20	183.37	464.03	.....	109.00	219.68	531.90	188.00	41.50	.....	559.90	42.50	41.58	.....
Colorado	15,000.00	10,773.53	691.20	1,546.99	335.17	16.82	.....	6.43	169.42	156.00	10.60	37.74	19.15	108.45	84.92	39.50	944.59	10.00	50.49	.....
Connecticut (State)	7,500.00	7,500.00	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Connecticut (Storrs)	7,500.00	4,091.08	1,057.53	76.78	336.13	96.45	627.36	220.98	190.20	64.23	133.34	.....	5.05	59.20	355.89	25.15	141.48	10.00	9.15	.....
Delaware	15,000.00	9,508.33	1,111.67	1,222.48	242.23	149.78	268.80	65.63	326.58	7.00	56.32	597.13	7.50	169.68	481.49	16.51	570.42	92.40	106.05	.....
Florida	15,000.00	5,102.59	3,156.87	1,040.91	294.34	240.37	124.17	70.60	570.61	374.19	788.18	83.40	312.27	57.50	486.72	846.42	708.86	10.00	732.00	.....
Georgia	15,000.00	7,605.00	2,257.78	1,865.31	213.35	207.04	166.38	.....	645.90	427.19	286.49	92.23	123.48	78.45	114.52	.....	168.17	16.00	732.71	.....
Idaho	15,000.00	7,207.32	3,244.95	695.62	23.95	124.60	702.33	210.19	90.34	.....	291.03	73.59	113.06	212.77	119.93	756.15	332.52	51.65	750.00	.....
Illinois	15,000.00	6,452.61	2,857.22	1,351.47	421.21	131.72	.....	139.34	395.97	.....	321.84	382.31	1,136.27	338.50	196.64	135.01	531.75	82.97	125.17	.....
Indiana	15,000.00	9,086.97	1,919.14	812.10	106.21	122.20	656.72	45.24	700.39	8.63	793.38	100.55	350.08	11.00	6.09	140.00	49.65	11.77	79.88	.....
Iowa	15,000.00	7,491.82	2,210.36	1,127.75	454.73	361.98	511.92	221.23	505.73	.....	536.11	15.62	243.47	109.13	539.39	534.85	32.23	10.00	93.68	.....
Kansas	15,000.00	8,516.54	2,645.58	438.35	169.50	137.49	11.00	111.88	258.31	.....	160.71	134.65	144.17	153.33	353.41	1,446.85	62.21	10.00	246.02	.....
Kentucky	15,000.00	10,742.68	1,666.22	667.20	137.10	69.46	85.26	174.66	170.45	.....	.....	746.45	92.95	.....	220.25	.....	131.25	96.07	.....	.....
Louisiana	15,000.00	7,181.28	2,879.75	1,768.85	379.51	295.85	306.97	484.36	286.46	101.66	355.88	227.78	404.55	.....	44.90	282.20	.....	.....	370.89	.....
Maine	15,000.00	7,902.34	1,756.75	286.77	275.01	219.48	801.54	441.42	398.40	128.33	991.27	141.15	160.48	99.08	291.83	446.03	289.23	.....	418.32	.....
Maryland	15,000.00	7,533.44	2,765.79	1,461.37	134.84	284.18	372.89	91.20	468.46	79.09	462.37	130.22	.....	226.67	68.70	245.00	247.46	10.00	290.59	.....
Massachusetts	15,000.00	8,157.57	2,941.04	1,436.30	269.33	99.82	259.63	.....	621.30	182.21	135.08	221.31	52.58	75.59	5.49	20.25	84.39	147.52	135.40	.....
Michigan	15,000.00	8,363.90	2,112.28	528.46	330.01	181.05	.....	139.57	386.09	27.65	135.17	332.54	35.71	115.50	720.20	1,259.41	203.06	.....	.....	.....
Minnesota	15,000.00	11,373.33	1,234.45	.....	29.00	.....	912.78	.....	350.15	.....	380.44	5.00	157.08	18.00	.....	25.00	204.77	199.80	110.20	.....
Mississippi	15,000.00	8,412.15	1,637.97	588.36	159.52	161.01	242.20	232.52	751.29	16.94	899.45	17.85	264.43	30.00	30.00	608.26	191.45	10.00	746.60	.....
Missouri	15,000.00	6,942.86	2,462.52	441.80	207.34	142.12	182.60	155.63	443.62	13.00	1,759.00	190.83	84.64	50.15	84.51	1,169.36	226.41	10.00	433.61	.....
Montana	15,000.00	8,129.38	3,000.00	1,518.31	171.62	286.37	266.45	89.82	477.05	9.50	73.47	116.25	422.10	162.50	277.18	.....	.....	.....	.....	.....
Nebraska	15,000.00	8,252.89	2,621.65	683.81	499.94	129.51	.....	116.42	646.03	5.00	150.00	226.66	201.28	91.60	442.26	66.75	265.89	26.15	574.16	.....
Nevada	15,000.00	9,299.30	2,786.50	1,021.19	106.95	117.10	150.60	39.70	388.79	.....	.....	20.30	3.00	59.80	1.35	.....	317.55	14.50	673.37	.....
New Hampshire	15,000.00	9,843.57	1,572.83	1,144.13	73.15	69.28	989.29	45.31	343.28	33.88	.....	196.95	52.80	4.68	47.09	.....	100.02	28.46	455.28	.....
New Jersey	15,000.00	9,460.00	1,146.52	1,176.41	212.48	70.77	309.94	83.39	125.64	65.90	267.01	660.16	7.75	14.97	426.62	35.00	313.19	166.77	457.48	.....
New Mexico	15,000.00	7,500.00	2,040.29	565.83	408.77	243.97	62.65	57.06	304.28	45.00	450.70	80.15	756.22	356.83	287.07	281.20	489.94	320.00	750.00	.....
New York (State)	1,500.00	.....	.....	803.15	.50	.....	21.89	33.50	147.17	.....	82.09	62.09	.....	75.00	69.44	.....	126.04	79.13	.....	.....
New York (Cornell)	13,500.00	8,936.77	1,199.43	1,468.23	482.29	90.24	74.25	101.46	491.35	6.75	42.83	66.79	21.58	106.33	248.86	19.50	117.15	25.00	1.19	.....

North Carolina	15,000.00	9,720.00	1,673.57	265.85	68.00	8.15	13.07	291.40	196.09	211.73	392.39	620.26	247.01	60.51	350.00	261.35	75.97	10.00	534.65	.....
North Dakota	15,000.00	5,316.52	6,931.18	1,187.58	137.90	43.26	146.80	.....	252.83	.....	775.61	.....	65.32	.....	.....	.....	125.00	18.00	.....	.....
Ohio	15,000.00	12,362.32	1,126.93	60.84	132.37	.....	71.50	.....	455.22	96.52	283.34	165.25	119.12	.....	33.75	.....	.....	10.00	82.84	.....
Oklahoma	15,000.00	5,430.00	2,496.85	2,046.64	426.54	215.41	472.06	328.70	274.08	.....	605.99	134.38	308.98	549.86	30.07	450.00	452.44	28.00	750.00	.....
Oregon	15,000.00	9,031.00	2,055.18	212.92	71.32	203.89	.....	724.36	1,139.69	37.50	293.95	194.89	244.59	13.65	212.08	251.85	.....	74.96	238.17	.....
Pennsylvania	15,000.00	10,409.35	839.60	884.98	181.76	.....	25.37	368.92	56.25	50.13	730.50	5.00	58.54	.....	766.28	128.02	299.22	14.67	181.41	.....
Rhode Island	15,000.00	8,876.93	2,788.15	40.74	220.48	161.37	320.57	90.81	531.91	180.87	479.94	499.62	106.95	39.37	209.31	44.70	268.33	19.31	120.64	.....
South Carolina	15,000.00	7,788.95	2,315.56	953.22	106.48	201.56	.....	465.72	1,057.41	91.33	272.06	268.03	81.93	52.87	99.95	67.30	431.49	15.89	730.25	.....
South Dakota	15,000.00	9,324.39	1,667.13	1,224.95	243.38	206.08	.....	280.51	156.34	.....	80.43	18.90	437.53	74.97	636.38	.....	99.44	20.00	29.57	$500.00
Tennessee	15,000.00	6,643.33	4,067.26	805.87	299.03	38.50	395.22	151.56	279.33	99.70	556.89	193.64	499.47	1.25	182.16	75.38	398.65	173.41	139.35	.....
Texas	15,000.00	8,862.28	1,291.35	866.59	376.88	234.92	44.52	238.77	606.75	42.43	192.20	195.36	310.32	423.63	436.09	8.00	328.15	.....	541.76	.....
Utah	15,000.00	5,898.80	4,091.89	1,640.15	268.49	204.31	240.92	202.27	252.29	53.75	875.17	60.44	338.16	131.32	136.50	248.45	51.85	10.00	295.24	.....
Vermont	15,000.00	6,882.60	2,459.48	890.05	533.57	125.14	366.80	323.70	189.77	98.71	1,579.07	158.31	28.64	168.45	170.54	50.00	452.82	19.70	502.65	.....
Virginia	15,000.00	8,871.08	2,666.00	1,361.24	82.25	240.96	238.39	161.97	409.74	226.13	428.80	.....	6.04	.....	240.40	50.00	21.60	10.00	35.40	.....
Washington	15,000.00	7,229.16	3,385.56	227.08	215.27	329.18	1,168.70	43.94	384.14	.....	210.35	1.67	275.95	3.67	399.39	181.05	541.90	.....	402.99	.....
West Virginia	15,000.00	10,064.85	918.27	.....	91.10	148.77	717.52	323.49	383.23	103.22	487.86	261.15	51.52	17.75	53.09	465.08	270.97	10.00	601.85	30.28
Wisconsin	15,000.00	10,815.00	2,784.81	.....	82.96	.....	10.25	18.53	527.35	25.00	54.08	283.44	309.55	.....	39.80	3.00	36.23	10.00	.....	.....
Wyoming	15,000.00	3,703.35	4,341.86	1,765.72	622.10	279.89	806.97	191.35	530.34	1.00	187.73	109.82	229.38	247.75	271.25	267.50	683.99	10.00	750.00	.....

[a] The expenditures under different heads are affected by the total revenue of the station, as shown in Table 2.

FEDERAL LEGISLATION, REGULATIONS, AND RULINGS AFFECTING AGRICULTURAL COLLEGES AND EXPERIMENT STATIONS.

FEDERAL LEGISLATION.

Act of 1862 Donating Lands for Agricultural Colleges.

AN ACT donating public lands to the several States and Territories which may provide colleges for the benefit of agriculture and the mechanic arts.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That there be granted to the several States, for the purposes hereinafter mentioned, an amount of public land, to be apportioned to each State a quantity equal to thirty thousand acres for each Senator and Representative in Congress to which the States are respectively entitled by the apportionment under the census of eighteen hundred and sixty: *Provided*, That no mineral lands shall be selected or purchased under the provisions of this act.

Sec. 2. That the land aforesaid, after being surveyed, shall be apportioned to the several States in sections or subdivisions of sections, not less than one quarter of a section; and whenever there are public lands in a State subject to sale at private entry at one dollar and twenty-five cents per acre, the quantity to which said State shall be entitled shall be selected from such lands within the limits of such State, and the Secretary of the Interior is hereby directed to issue to each of the States in which there is not the quantity of public lands subject to sale at private entry at one dollar and twenty-five cents per acre to which said State may be entitled under the provisions of this act land scrip to the amount in acres for the deficiency of its distributive share; said scrip to be sold by said States and the proceeds thereof applied to the uses and purposes prescribed in this act and for no other use or purpose whatsoever: *Provided*, That in no case shall any State to which land scrip may thus be issued be allowed to locate the same within the limits of any other State or of any Territory of the United States, but their assignees may thus locate said land scrip upon any of the unappropriated lands of the United States subject to sale at private entry at one dollar and twenty-five cents, or less, per acre: *And provided further*, That not more than one million acres shall be located by such assignees in any one of the States: *And provided further*, That no such location shall be made before one year from the passage of this act.

Sec. 3. That all the expenses of management, superintendence, and taxes from date of selection of said lands, previous to their sales, and all expenses incurred in the management and disbursement of the moneys which may be received therefrom, shall be paid by the States to which they may belong, out of the treasury of said States, so that the entire proceeds of the sale of said lands shall be applied without any diminution whatever to the purposes hereinafter mentioned.

Sec. 4. That all moneys derived from the sale of the lands aforesaid by the States to which the lands are apportioned, and from the sales of land scrip hereinbefore provided for, shall be invested in stocks of the United States, or of the States, or some other safe stocks, yielding not less than five per centum upon the par value of said stocks; and that the moneys so invested shall constitute a perpetual fund, the capital of which shall remain forever undiminished (except so far as may be provided

in section fifth of this act), and the interest of which shall be inviolably appropriated, by each State which may take and claim the benefit of this act, to the endowment, support, and maintenance of at least one college where the leading object shall be, without excluding other scientific and classical studies, and including military tactics, to teach such branches of learning as are related to agriculture and the mechanic arts, in such manner as the legislatures of the States may respectively prescribe, in order to promote the liberal and practical education of the industrial classes in the several pursuits and professions in life.

SEC. 5. That the grant of land and land scrip hereby authorized shall be made on the following conditions, to which, as well as to the provisions hereinbefore contained, the previous assent of the several States shall be signified by legislative acts:

First. If any portion of the fund invested, as provided by the foregoing section, or any portion of the interest thereon, shall, by any action or contingency, be diminished or lost, it shall be replaced by the State to which it belongs, so that the capital of the fund shall remain forever undiminished; and the annual interest shall be regularly applied without diminution to the purposes mentioned in the fourth section of this act, except that a sum, not exceeding 10 per centum upon the amount received by any State under the provisions of this act, may be expended for the purchase of lands for sites or experimental farms, whenever authorized by the respective legislatures of said States.

Second. No portion of said fund, nor the interest thereon, shall be applied, directly or indirectly, under any pretense whatever, to the purchase, erection, preservation, or repair of any building or buildings.

Third. Any State which may take and claim the benefit of the provisions of this act shall provide, within five years, at least not less than one college, as described in the fourth section of this act, or the grant to such State shall cease; and said State shall be bound to pay the United States the amount received of any lands previously sold, and that the title to purchasers under the State shall be valid.

Fourth. An annual report shall be made regarding the progress of each college, recording any improvements and experiments made, with their cost and results, and such other matters, including State industrial and economical statistics, as may be supposed useful, one copy of which shall be transmitted by mail free, by each, to all the other colleges which may be endowed under the provisions of this act, and also one copy to the Secretary of the Interior.

Fifth. When lands shall be selected from those which have been raised to double the minimum price, in consequence of railroad grants, they shall be computed to the State at the maximum price and the number of acres proportionately diminished.

Sixth. No State while in a condition of rebellion or insurrection against the Government of the United States shall be entitled to the benefit of this act.

Seventh. No State shall be entitled to the benefits of this act unless it shall express its acceptance thereof by its legislature within two years from the date of its approval by the President.

SEC. 6. That land scrip issued under the provisions of this act shall not be subject to location until after the first day of January, one thousand eight hundred and sixty-three.

SEC. 7. That the land officers shall receive the same fees for locating land scrip issued under the provisions of this act as is now allowed for the location of military bounty land warrants under existing laws: *Provided*, Their maximum compensation shall not be thereby increased.

SEC. 8. That the governors of the several States to which scrip shall be issued under this act shall be required to report annually to Congress all sales made of such scrip until the whole shall be disposed of, the amount received for the same, and what appropriation has been made of the proceeds.

Approved, July 2, 1862.

Act of 1866 Extending the Time Within Which Agricultural Colleges May be Established.

AN ACT to amend the fifth section of an act entitled "An act donating public lands to the several States and Territories which may provide colleges for the benefit of agriculture and the mechanic arts," approved July 2, 1862, so as to extend the time within which the provisions of said act shall be accepted and such colleges established.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the time in which the several States may comply with the provisions of the act of July two, eighteen hundred and sixty-two, entitled "An act donating public lands to the several States and Territories which may provide colleges for the benefit of agriculture and the mechanic arts," is hereby extended so that the acceptance of the benefits of the said act may be expressed within three years from the passage of this act, and the colleges required by the said act may be provided within five years from the date of the filing of such acceptance with the Commissioner of the General Land Office: *Provided*, That when any Territory shall become a State and be admitted into the Union, such new State shall be entitled to the benefits of the said act of July two, eighteen hundred and sixty-two, by expressing the acceptance therein required within three years from the date of its admission into the Union, and providing the college or colleges within five years after such acceptance, as prescribed in this act: *Provided further*, That any State which has heretofore expressed its acceptance of the act herein referred to shall have the period of five years within which to provide at least one college, as described in the fourth section of said act, after the time for providing said college, according to the act of July second, eighteen hundred and sixty-two, shall have expired.

Approved, July 23, 1866.

Act of 1887 Establishing Agricultural Experiment Stations.

AN ACT to establish agricultural experiment stations in connection with the colleges established in the several States under the provisions of an act approved July second, eighteen hundred and sixty-two, and the acts supplementary thereto.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That in order to aid in acquiring and diffusing among the people of the United States useful and practical information on subjects connected with agriculture, and to promote scientific investigation and experiment respecting the principles and applications of agricultural science, there shall be established, under direction of the college or colleges or agricultural department of colleges in each State or Territory established, or which may hereafter be established, in accordance with the provisions of an act approved July second, eighteen hundred and sixty-two, entitled "An act donating public lands to the several States and Territories which may provide colleges for the benefit of agriculture and the mechanic arts," or any of the supplements to said act, a department to be known and designated as an "agricultural experiment station:" *Provided*, That in any State or Territory in which two such colleges have been or may be so established the appropriation hereinafter made to such State or Territory shall be equally divided between such colleges, unless the legislature of such State or Territory shall otherwise direct.

SEC. 2. That it shall be the object and duty of said experiment stations to conduct original researches or verify experiments on the physiology of plants and animals; the diseases to which they are severally subject, with the remedies of the same; the chemical composition of useful plants at their different stages of growth; the comparative advantages of rotative cropping as pursued under a varying series of crops; the capacity of new plants or trees for acclimation; the analysis of soils and water; the chemical composition of manures, natural or artificial, with experiments designed to test their comparative effects on crops of different kinds; the adaptation and

value of grasses and forage plants; the composition and digestibility of the different kinds of food for domestic animals; the scientific and economic questions involved in the production of butter and cheese; and such other researches or experiments bearing directly on the agricultural industry of the United States as may in each case be deemed advisable, having due regard to the varying conditions and needs of the respective States or Territories.

SEC. 3. That in order to secure, as far as practicable, uniformity of methods and results in the work of said stations, it shall be the duty of the United States Commissioner [now Secretary] of Agriculture to furnish forms, as far as practicable, for the tabulation of results of investigation or experiments; to indicate from time to time such lines of inquiry as to him shall seem most important; and, in general, to furnish such advice and assistance as will best promote the purpose of this act. It shall be the duty of each of said stations annually, on or before the first day of February, to make to the governor of the State or Territory in which it is located a full and detailed report of its operations, including a statement of receipts and expenditures, a copy of which report shall be sent to each of said stations, to the said Commissioner [now Secretary] of Agriculture, and to the Secretary of the Treasury of the United States.

SEC. 4. That bulletins or reports of progress shall be published at said stations at least once in three months, one copy of which shall be sent to each newspaper in the States or Territories in which they are respectively located, and to such individuals actually engaged in farming as may request the same and as far as the means of the station will permit. Such bulletins or reports and the annual reports of said stations shall be transmitted in the mails of the United States free of charge for postage, under such regulations as the Postmaster-General may from time to time prescribe.

SEC. 5. That for the purpose of paying the necessary expenses of conducting investigations and experiments and printing and distributing the results as hereinbefore prescribed, the sum of fifteen thousand dollars per annum is hereby appropriated to each State, to be specially provided for by Congress in the appropriations from year to year, and to each Territory entitled under the provisions of section eight of this act, out of any money in the Treasury proceeding from the sales of public lands, to be paid in equal quarterly payments on the first day of January, April, July, and October in each year, to the treasurer or other officer duly appointed by the governing boards of said colleges to receive the same, the first payment to be made on the first day of October, eighteen hundred and eighty-seven: *Provided, however*, That out of the first annual appropriation so received by any station an amount not exceeding one-fifth may be expended in the erection, enlargement, or repair of a building or buildings necessary for carrying on the work of such station; and thereafter an amount not exceeding five per centum of such annual appropriation may be so expended.

SEC. 6. That whenever it shall appear to the Secretary of the Treasury from the annual statement of receipts and expenditures of any of said stations that a portion of the preceding annual appropriation remains unexpended, such amount shall be deducted from the next succeeding annual appropriation to such station, in order that the amount of money appropriated to any station shall not exceed the amount actually and necessarily required for its maintenance and support.

SEC. 7. That nothing in this act shall be construed to impair or modify the legal relation existing between any of the said colleges and the government of the States or Territories in which they are respectively located.

SEC. 8. That in States having colleges entitled under this section to the benefits of this act and having also agricultural experiment stations established by law separate from said colleges, such State shall be authorized to apply such benefits to experiments at stations so established by such States; and in case any State shall have established under the provisions of said act of July second, aforesaid, an agricultural

department or experimental station, in connection with any university, college, or institution not distinctly an agricultural college or school, and such State shall have established or shall hereafter establish a separate agricultural college or school, which shall have connected therewith an experimental farm or station, the legislature of such State may apply in whole or in part the appropriation by this act made to such separate agricultural college or school, and no legislature shall by contract, express or implied, disable itself from so doing.

SEC. 9. That the grants of moneys authorized by this act are made subject to the legislative assent of the several States and Territories to the purposes of said grants: *Provided*, That payment of such installments of the appropriation herein made as shall become due to any State before the adjournment of the regular session of its legislature meeting next after the passage of this act shall be made upon the assent of the governor thereof duly certified to the Secretary of the Treasury.

SEC. 10. Nothing in this act shall be held or construed as binding the United States to continue any payments from the Treasury to any or all the States or institutions mentioned in this act, but Congress may at any time amend, suspend, or repeal any or all the provisions of this act.

Approved, March 2, 1887.

ACT OF 1890 FOR THE FURTHER ENDOWMENT OF AGRICULTURAL COLLEGES.

AN ACT to apply a portion of the proceeds of the public lands to the more complete endowment and support of the colleges for the benefit of agriculture and the mechanic arts established under the provisions of an act of Congress approved July second, eighteen hundred and sixty-two.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That there shall be, and hereby is, annually appropriated, out of any money in the Treasury not otherwise appropriated, arising from the sales of public lands, to be paid as hereinafter provided, to each State and Territory for the more complete endowment and maintenance of colleges for the benefit of agriculture and the mechanic arts now established, or which may be hereafter established, in accordance with an act of Congress approved July second, eighteen hundred and sixty-two, the sum of fifteen thousand dollars for the year ending June thirtieth, eighteen hundred and ninety, and an annual increase of the amount of such appropriation thereafter for ten years by an additional sum of one thousand dollars over the preceding year, and the annual amount to be paid thereafter to each State and Territory shall be twenty-five thousand dollars, to be applied only to instruction in agriculture, the mechanic arts, the English language, and the various branches of mathematical, physical, natural, and economic science, with special reference to their applications in the industries of life and to the facilities for such instruction: *Provided*, That no money shall be paid out under this act to any State or Territory for the support and maintenance of a college where a distinction of race or color is made in the admission of students, but the establishment and maintenance of such college separately for white and colored students shall be held to be a compliance with the provisions of this act if the funds received in such State or Territory be equitably divided as hereinafter set forth: *Provided*, That in any State in which there has been one college established in pursuance of the act of July second, eighteen hundred and sixty-two, and also in which an educational institution of like character has been established, or may be hereafter established, and is now aided by such State from its own revenue, for the education of colored students in agriculture and the mechanic arts, however named or styled, or whether or not it has received money heretofore under the act to which this act is an amendment, the legislature of such State may propose and report to the Secretary of the Interior a just and equitable division of the fund to be received under this act, between one college for white students and one institution for colored students, established as aforesaid, which shall be divided into

two parts, and paid accordingly, and thereupon such institution for colored students shall be entitled to the benefits of this act and subject to its provisions, as much as it would have been if it had been included under the act of eighteen hundred and sixty-two, and the fulfillment of the foregoing provisions shall be taken as a compliance with the provisions in reference to separate colleges for white and colored students.

SEC. 2. That the sums hereby appropriated to the States and Territories for the further endowment and support of colleges shall be annually paid on or before the thirty-first day of July of each year, by the Secretary of the Treasury, upon the warrant of the Secretary of the Interior, out of the Treasury of the United States, to the State or Territorial treasurer, or to such officer as shall be designated by the laws of such State or Territory to receive the same, who shall, upon the order of the trustees of the college, or the institution for colored students, immediately pay over said sums to the treasurers of the respective colleges or other institutions entitled to receive the same, and such treasurers shall be required to report to the Secretary of Agriculture and to the Secretary of the Interior, on or before the first day of September of each year, a detailed statement of the amount so received and of its disbursement. The grants of moneys authorized by this act are made subject to the legislative assent of the several States and Territories to the purpose of said grants: *Provided*, That payments of such installments of the appropriation herein made as shall become due to any State before the adjournment of the regular session of legislature meeting next after the passage of this act shall be made upon the assent of the governor thereof, duly certified by the Secretary of the Treasury.

SEC. 3. That if any portion of the moneys received by the designated officer of the State or Territory for the further and more complete endowment, support, and maintenance of colleges, or of institutions for colored students, as provided in this act, shall, by any action or contingency, be diminished or lost, or be misapplied, it shall be replaced by the State or Territory to which it belongs, and until so replaced no subsequent appropriation shall be apportioned or paid to such State or Territory; and no portion of said moneys shall be applied, directly or indirectly, under any pretense whatever, to the purchase, erection, preservation, or repair of any building or buildings. An annual report by the president of each of said colleges shall be made to the Secretary of Agriculture, as well as to the Secretary of the Interior, regarding the condition and progress of each college, including statistical information in relation to its receipts and expenditures, its library, the number of its students and professors, and also as to any improvements and experiments made under the direction of any experiment stations attached to said colleges, with their cost and results, and such other industrial and economical statistics as may be regarded as useful, one copy of which shall be transmitted by mail free to all other colleges further endowed under this act.

SEC. 4. That on or before the first day of July in each year, after the passage of this act, the Secretary of the Interior shall ascertain and certify to the Secretary of the Treasury as to each State and Territory whether it is entitled to receive its share of the annual appropriation for colleges, or of institutions for colored students, under this act, and the amount which thereupon each is entitled, respectively, to receive. If the Secretary of the Interior shall withhold a certificate from any State or Territory of its appropriation, the facts and reasons therefor shall be reported to the President, and the amount involved shall be kept separate in the Treasury until the close of the next Congress, in order that the State or Territory may, if it should so desire, appeal to Congress from the determination of the Secretary of the Interior. If the next Congress shall not direct such sum to be paid, it shall be covered into the Treasury. And the Secretary of the Interior is hereby charged with the proper administration of this law.

SEC. 5. That the Secretary of the Interior shall annually report to Congress the dis-

bursements which have been made in all the States and Territories, and also whether the appropriation of any State or Territory has been withheld, and if so, the reasons therefor.

SEC. 6. Congress may at any time amend, suspend, or repeal any or all of the provisions of this act.

Approved, August 30, 1890.

EXTRACTS FROM AN ACT MAKING APPROPRIATIONS FOR THE DEPARTMENT OF AGRICULTURE FOR THE FISCAL YEAR ENDING JUNE 30, 1901.

AGRICULTURAL EXPERIMENT STATIONS: To carry into effect the provisions of an act approved March second, eighteen hundred and eighty-seven, entitled "An act to establish agricultural experiment stations in connection with the colleges established in the several States under the provisions of an act approved July second, eighteen hundred and sixty-two, and of the acts supplementary thereto," and to enforce the execution thereof, seven hundred and eighty thousand dollars, thirty-three thousand dollars of which sum shall be payable upon the order of the Secretary of Agriculture, to enable him to carry out the provisions of section three of said act of March second, eighteen hundred and eighty-seven, and twelve thousand dollars of which sum may be expended by the Secretary of Agriculture to investigate and report to Congress upon the agricultural resources and capabilities of Alaska; and to establish and maintain agricultural experiment stations in said Territory, including the erection of buildings and all other expenses essential to the maintenance of such stations, of which sum five thousand dollars shall be immediately available; and the Secretary of Agriculture shall prescribe the form of the annual financial statement required by section three of said act of March second, eighteen hundred and eighty-seven; shall ascertain whether the expenditures under the appropriation hereby made are in accordance with the provisions of the said act, and shall make report thereon to Congress; and the Secretary of Agriculture is hereby authorized to employ such assistants, clerks, and other persons as he may deem necessary, in the city of Washington and elsewhere, and to incur such other expenses for office fixtures and supplies, stationery, traveling, freight, and express charges, illustration of the Experiment Station Record, bulletins, and reports as he may find essential in carrying out the objects of the above acts, and the sums apportioned to the several States shall be paid quarterly in advance.

And the Secretary of Agriculture is hereby authorized to furnish to such institutions or individuals as may care to buy them, copies of the card index of agricultural literature prepared by the Office of Experiment Stations, and charge for the same a price covering the additional expense involved in the preparation of these copies, and he is hereby authorized to apply the moneys received toward the expense of the preparation of the index.

And the Secretary of Agriculture is hereby authorized to expend ten thousand dollars of which sum to establish and maintain an agricultural station in the Hawaiian Islands, including the erection of buildings, the printing (in the Hawaiian Islands), illustration, and distribution of reports and bulletins, and all other expenses essential to the maintenance of said station, which sum shall be immediately available.

And the Secretary of Agriculture is hereby authorized to expend five thousand dollars of which sum to investigate and report to Congress on the agricultural resources and capabilities of Porto Rico, with special reference to the selection of locations for agricultural experiment stations, and the determination of the character and extent of agricultural experiments immediately demanded by the condition of agriculture in that island, and to prepare, print, publish, and distribute in Porto Rico circulars of inquiry and bulletins of information in the English and Spanish languages, which sum shall be immediately available; in all, seven hundred and eighty thousand dollars. * * *

NUTRITION INVESTIGATIONS: To enable the Secretary of Agriculture to investigate and report upon the nutritive value of the various articles and commodities used for human food, with special suggestions of full, wholesome, and edible rations, less wasteful and more economical than those in common use, seventeen thousand five hundred dollars; and the agricultural experiment stations are hereby authorized to cooperate with the Secretary of Agriculture in carrying out said investigations in such manner and to such extent as may be warranted by a due regard to the varying conditions and needs of the respective States and Territories, and as may be mutually agreed upon; and the Secretary of Agriculture is hereby authorized to require said stations to report to him the results of any such investigations which they may carry out, whether in cooperation with said Secretary of Agriculture or otherwise.

IRRIGATION INVESTIGATIONS: To enable the Secretary of Agriculture to investigate and report upon the laws and institutions relating to irrigation and upon the use of irrigation waters, with special suggestions of better methods for the utilization of irrigation waters in agriculture than those in common use, and for the preparation, printing, and illustration of reports and bulletins on irrigation; and the agricultural experiment stations are hereby authorized and directed to cooperate with the Secretary of Agriculture in carrying out said investigations in such manner and to such extent as may be warranted by a due regard to the varying conditions and needs of the respective States and Territories as may be mutually agreed upon; fifty thousand dollars.

PUBLIC ROAD INQUIRIES: To enable the Secretary of Agriculture to make inquiries in regard to the system of road management throughout the United States; to make investigations in regard to the best methods of road making, and the best kind of road-making materials in the several States; the employment of local and special agents, clerks, assistants, and other labor required in conducting experiments in the city of Washington and elsewhere and in collating, digesting, reporting, and illustrating the results of such experiments; for labor, traveling, and other necessary expenses, and for preparing and publishing bulletins and reports on this subject for distribution, and to enable him to assist the agricultural colleges and experiment stations in disseminating information on this subject, fourteen thousand dollars. * * *

GRASS AND FORAGE-PLANT INVESTIGATION AND ANIMAL FOODS, DIVISION OF AGROSTOLOGY: * * * The agricultural experiment stations are hereby authorized and directed to cooperate with the Secretary of Agriculture in establishing and maintaining experimental grass stations, for determining the best methods of caring for and improving meadows and grazing lands, the use of different grasses and forage plants, and their adaptability to various soils and climates, the best native and foreign species for reclaiming overstocked ranges and pastures, for renovating worn-out lands, for binding drifting sands and washed lands, and for turfing lawns and pleasure grounds, and for solving the various forage problems presented in the several sections of our country, seventeen thousand dollars: *Provided*, That six thousand dollars of the amount hereby appropriated be used to purchase and collect seeds, roots, and specimens of valuable and economic grasses and forage plants, to be distributed to the various experiment stations in the several States and Territories, to be by them used, under the direction of the Secretary of Agriculture, to ascertain their adaptability to the various soils and climates of the United States. * * *

PURCHASE AND DISTRIBUTION OF VALUABLE SEEDS: For the purchase, propagation, and distribution of valuable seeds, bulbs, trees, shrubs, vines, cuttings, and plants; the employment of local and special agents, clerks, assistants, and other labor required in the city of Washington and elsewhere; transportation, paper, twine, gum, printing, postal cards, and all necessary material and repairs for putting up and distributing the same, and to be distributed in localities adapted to their culture, one hundred and seventy thousand dollars: * * * *Provided further*, That twenty

thousand dollars of the sum thus appropriated, or so much thereof as the Secretary of Agriculture shall direct, may be used to collect, purchase, test, propagate, and distribute rare and valuable seeds, bulbs, trees, shrubs, vines, cuttings, and plants from foreign countries for experiments with reference to their introduction into this country; and the seeds, bulbs, trees, shrubs, vines, cuttings, and plants thus collected, purchased, tested, and propagated shall not be included in general distribution, but shall be used for experimental tests, to be carried on with the cooperation of the agricultural experiment stations.

REGULATIONS OF THE POST-OFFICE DEPARTMENT CONCERNING AGRICULTURAL EXPERIMENT STATION PUBLICATIONS.

Section 372 of the Postal Laws and Regulations of the United States reads as follows:
Regulations for free transmission of bulletins and reports [under the act of Congress of March 2, 1887, are prescribed as follows:

(1) Any claimant of the privilege must apply for authority to exercise it to the Postmaster-General, stating the date of the establishment of such station, its proper name or designation, its official organization, and the names of its officers; the name of the university, college, school, or institution to which it is attached, if any, the legislation of the State or Territory providing for its establishment, and any other granting it the benefits of the provision made by Congress as aforesaid (accompanied by a copy of the act or acts), and whether any other such station in the same State or Territory is considered, or claims to be, also entitled to the privilege; and also the place of its location and the name of the post-office where the bulletins and reports will be mailed. The application must be signed by the officer in charge of the station.

(2) If such application be allowed after examination by the Department, the postmaster at the proper office will be instructed to admit such bulletins and reports to the mails in compliance with these regulations, and the officer in charge of the station will be notified thereof.

(3) Only such bulletins or reports as shall have been issued after the station became entitled to the benefits of the act can be transmitted free, and such bulletins or reports may be inclosed in envelopes or wrappers, sealed or unsealed. On the exterior of every envelope, wrapper, or package must be written or printed the uame of the station and place of its location, the designation of the inclosed bulletin or report, and the word "Free" over the signature, or facsimile thereof, of the officer in charge of the station, to be affixed by himself or by some one duly deputed by him for that purpose. There may also be written or printed upon the envelope or wrapper a request that the postmaster at the office of delivery will notify the mailing station of the change of address of the addressee, or other reason for inability to deliver the same, and upon a bulk package a request to the postmaster to open and distribute the "franked" matter therein in accordance with the address thereon.

Bulletins published by the United States Department of Agriculture and analogous to those of the station, and entitled to be mailed free under the penalty envelope of that Department, may also be adopted and mailed by the several stations, with their own publications, under the same regulations, and any bulletins or reports mailable free by any agricultural experiment station under these regulations may be so mailed by any other station having free-mailing authority.

If such station's annual reports be printed by State authority, and consist in part of matter relating to the land-grant college to which such station is attached, then said report may be mailed free entire by the director of the station; provided, in his judgment, the whole consists of useful information of an agricultural character.

(4) The bulletins may be mailed to the stations, newspapers, or persons to whom they are by the foregoing act authorized to be sent, and the annual reports to any

address within the United States, Canada, Mexico, or Hawaiian Kingdom (Sandwich Islands), but not to other foreign countries, free of postage.

An order of the Postmaster-General dated January 3, 1899, provides "That any article entitled to transmission free of postage in the domestic mails of the United States, either in a 'penalty' envelope or under a duly authorized 'frank,' shall be entitled likewise to transmission by mail free of postage between places in Hawaii, Cuba, Porto Rico, and the Philippine Islands; from the United States to those islands, and from those islands to the United States."

Among rulings on matters of detail the following are the most important:

"In sending out bulletins from an agricultural experiment station it is permissible to inclose postal cards to enable correspondents of the station to acknowledge the receipt of its publications and to request their continuous transmission.

"Copies of the reports or bulletins of the agricultural experiment stations, which are purchased, paid, or subscribed for, or otherwise disposed of for gain, when sent in the mails, are not entitled to free carriage under the 'frank' of the director of the station."

Station bulletins and reports, consisting of typewritten matter duplicated on a mimeograph or other duplicating machine, "retain their character as free matter when properly franked by the director of the station."

Reports of State boards of agriculture or other State boards, commissioners, or officers, even though they contain station bulletins and reports, can not be sent free through the mails under the frank of the director of the station.

The catalogue of the college of which the station is a department can not be sent free through the mails under the frank of the director of the station, whether said catalogue is published separately or is bound together with a station publication.

RULINGS OF THE TREASURY DEPARTMENT AFFECTING AGRICULTURAL EXPERIMENT STATIONS.

From copies of letters addressed to the Secretary of the Treasury and others by the First Comptroller of the Treasury, relating to the construction of the act of Congress of March 2, 1887, and acts supplementary thereto, the following digest has been prepared for the use of the stations. The sections are those of the act, the dates those of the decisions by the Comptroller:

SECTION 3—JANUARY 30, 1888.

That the annual financial statement of the stations, with vouchers, should not be sent to the Treasury Department, but that a copy simply of the report that is made to the governor is to be sent to the Secretary of the Treasury.

SECTION 3—JANUARY 31, 1888.

First. That the Treasury Department will not require officers of experiment stations to do or perform anything not specifically required by said bill.

Second. That the Secretary of the Treasury is not required to take a bond of the officers of said stations for the money paid over under the provisions of said act.

Third. That no reports will be required from the stations directly to the Secretary of the Treasury; but the governor of the State must send to the Secretary of the Treasury a copy of the report made to him by the colleges or stations.

SECTION 4—DECEMBER 16, 1895.

The Solicitor of the Treasury writes: "I am of the opinion that there is no authority for an agricultural experiment station to sell its bulletins outside of the State or Territory. Congress appropriates for the publication and free distribution of the bulletins, and neither expressly nor by necessary implication authorizes their sale."

SECTION 6—AUGUST 2, 1888.

The fiscal year commences on the 1st day of July, corresponding with the fiscal year of the Government.

An agricultural station entitled to the benefits of said appropriations made by Congress can anticipate the payment to be made July 1, and make contracts of purchases prior to that time, if it shall be necessary to carry on the work of the station. Of course, no portion of said appropriations paid in quarterly installments can be drawn from the Treasury unless needed for the purposes indicated in the act; and so much of what is so drawn as may not have been expended within the year must be accounted for as part of the appropriation for the following year.

SECTION 8—JANUARY 30, 1888.

The State of New York ought to designate whether to the college or to the station, or to both, it desires the appropriation to be applied. The eighth section of the act seems to authorize the State to apply such benefits to experimental stations it may have established as it desires.

Where there are no experimental stations connected with the colleges, the legislatures of such States must connect the agricultural experiment station with the colleges already established under the act of July 2, 1862; there is no authority in the act authorizing the establishment of agricultural experiment stations independent of said colleges.

The act contemplates that where stations have already been established disconnected from the colleges, the legislatures of such States may make such provisions in regard thereto as they may deem proper; but it does not authorize the establishment of stations except in connection with the colleges that were at that time or might thereafter be established under the act of July 2, 1862.

SECTION 8—FEBRUARY 14, 1888.

Where there is an agricultural college or station which may have been established by State authority, and is maintained by the State, the eighth section of the above act would authorize the State to designate the station to which it desired the appropriation to be applied, whether to one or more, or all, and the Secretary of the Treasury should make the payment under the appropriation to whichever one the State might designate.

SECTIONS 1 AND 8—FEBRUARY 15, 1888.

(1) When an agricultural college or station has been established under the act of July 2, 1862, each college is entitled to the benefits of the provisions of said act (i. e., of March 2, 1887).

(2) In a State where an agricultural college has been established under the act of July 2, 1862, and agricultural stations have also been established, either under the act of July 2, 1862, or by State authority, before March 2, 1887, the legislature of such State shall determine which one of said institutions, or how many of them, shall receive the benefits of the act of March 2, 1887.

(3) If the legislature of any State in which an agricultural college has been established under the act of July 2, 1862, desires to establish an agricultural station which shall be entitled to the benefits of said act, it must establish such station in connection with said college.

PROVISO TO SECTIONS 1 AND 8—DECEMBER 7, 1888.

It is within the power of the legislature of any State that has accepted the provisions of said act of March 2, 1887, to dispose of the amount appropriated by Congress for said station to either one or all of the agricultural colleges or stations which may have been established in said State by virtue of either of the provisions of the act of July 2, 1862, or the provisions of said eighth section of the act of March 2, 1887.

The whole responsibility rests upon the State legislature as to how the fund appropriated by Congress shall be distributed among these various institutions of the State, provided there is one or more agricultural colleges with which an agricultural station is connected, or one or more agricultural stations.

RULINGS OF THE DEPARTMENT OF AGRICULTURE ON THE WORK AND EXPENDITURES OF AGRICULTURAL EXPERIMENT STATIONS.[a]

In connection with examinations of the work and expenditures of the agricultural experiment stations established in accordance with the act of Congress of March 2, 1887, under authority given to the Secretary of Agriculture by Congress, questions have arisen which have seemed to make it advisable to formulate the views of this Department on certain matters affecting the management of the stations under that act. The statements given below have therefore been prepared to cover the points which seem to require special attention:

EXPENDITURES FOR PERMANENT SUBSTATIONS.

This Department holds that the expenditure of funds appropriated in accordance with the provisions of the act of Congress of March 2, 1887, for the maintenance of permanent substations is contrary to the spirit and intent of said act. The act provides for an experiment station in each State and Territory, which, except in cases specified in the act, is to be a department of the college established under the act of Congress of July 2, 1862. The objects of the stations, as defined in the first-mentioned act, are evidently of such a character as to necessitate the services of scientific and expert workers. Most of the lines of investigation named in the act are general, rather than local, and involve scientific equipment and work. It is obviously the intent that the stations established under this act shall carry on important investigations which shall be of general benefit to the agriculture of the several States and Territories. The sum of $15,000, which is annually appropriated by Congress under this act for each station, is only sufficient to carry out a limited number of investigations of the kind contemplated by the act.

As the work of the stations in the different States has developed, it has been found necessary to limit, rather than expand, the lines of work of the individual stations. Thorough work in a few lines has been found much more effective and productive of more useful results than small investigations in numerous lines. When we consider the nature of the investigations, the amount of money provided for the work of each station, and the fact that the act expressly provides for only a single station in connection with each college, it becomes very clear that expenditures such as are necessary to effectively maintain permanent substations ought not to be made from the funds granted by Congress to the States and Territories for experiment stations. The maintenance of permanent substations as a rule involves the erection of buildings and the making of other permanent improvements. The sums of money which can be expended for permanent improvements under the act of Congress aforesaid are so small that it is clear they were not intended to meet the needs of more than one station in each State and Territory.

When the legislature of a State or Territory has given its assent to the provisions of the act of Congress of March 2, 1887, and has designated the institution which shall receive the benefits of said act, it would seem to have exhausted its powers in the matter. The responsibility for the maintenance of an experiment station under said act devolves upon the governing board of the institution thus designated. If the legislature of the State or Territory sees fit to provide funds for the equipment and maintenance of other experiment stations and to put them under the control of the same governing board, well and good, but this does not in any way diminish the

[a] U. S. Dept. Agr., Office of Experiment Stations Circular 29.

responsibility of the board to administer the funds granted by Congress in accordance with the provisions of said act.

The wisdom of Congress in limiting the number of stations to be established in each State and Territory under the aforesaid act has been clearly shown by the experience of the few States and Territories which have attempted the maintenance of substations with the funds granted under said act. The expense of maintaining substations has as a rule materially weakened the central station, and the investigations carried on at the substations have been superficial and temporary. It is granted that in many States and Territories more than one agricultural experiment station might do useful work, and in some States more than one station has already been successfully maintained; but in all these cases the State has given funds from its own treasury to supplement those given by Congress. It is also granted that experiment stations established under said act of Congress and having no other funds than those provided by that act will often need to carry on investigations in different localities in their respective States and Territories, but it is held that this should be done in such a way as will secure the thorough supervision of such investigations by the expert officers of the station and that arrangement for such experimental inquiries should not be of so permanent a character as to prevent the station from shifting its work from place to place as circumstances may require, nor involve the expenditure of funds in such amounts and in such ways as will weaken the work of the station as a whole.

As far as practicable, the cooperation of individuals and communities benefited by these special investigations should be sought, and if necessary the aid of the States invoked to carry on enterprises too great to be successfully conducted within the limits of the appropriation granted by Congress under the act aforesaid.

PURCHASE OR RENTAL OF LANDS FOR AGRICULTURAL EXPERIMENT STATIONS.

This Department holds that the purchase or rental of lands by the experiment stations from the funds appropriated in accordance with the provisions of the act of Congress of March 2, 1887, is contrary to the spirit and intent of said act. The act provides for "paying the necessary expenses of conducting investigations and experiments and printing and distributing the results. * * * *Provided, however*, That out of the first annual appropriation so received by any station an amount not exceeding one-fifth may be expended in the erection, enlargement, or repair of a building or buildings necessary for carrying on the work of such stations; and thereafter an amount not exceeding 5 per centum of such annual appropriation may be so expended." The only reference to land for the station in the act is in section 8, where State legislatures are authorized to apply appropriations made under said act to separate agricultural colleges or schools established by the State "which shall have connected therewith an experimental farm or station." The strict limitation of the amount provided for buildings and the absence of any provision for the purchase or rental of lands, when taken in connection with the statement in the eighth section, which treats the farm as in a sense a necessary adjunct of the educational institution to which the whole or a part of the funds appropriated in accordance with said act might in certain cases be devoted, point to the conclusion that it was expected that the institution of which the station is a department would supply the land needed for experimental purposes and that charges for the purchase or rental of lands would not be made against the funds provided by Congress for the experiment station. This conclusion is reenforced by considerations of a wise and economic policy in the management of agricultural experiment stations, especially as relating to cases in which it might be desirable for the station to have land for experimental purposes in different localities. The investigations carried on by the stations in such cases being for the direct benefit of agriculture in the localities where the work is done, it seems only reasonable that persons or communities whose interests will be advanced by the station work should contribute the use of the small tracts of land

which will be required for experimental purposes. Experience shows that in most cases the stations have had no difficulty in securing such land as they needed, without expense, and it is believed that this may be done in every case without injuriously affecting the interests of the stations.

EXPENDITURES BY AGRICULTURAL EXPERIMENT STATIONS FOR CARRYING ON FARM OPERATIONS.

This Department holds that expenses incurred in conducting the operations of farms, whether the farms are connected with institutions established under the act of Congress of July 2, 1862, or not, are not a proper charge against the funds appropriated by Congress for agricultural experiment stations in accordance with the act of Congress of March 2, 1887, unless such operations definitely constitute a part of agricultural investigations or experiments planned and conducted in accordance with the terms of the act aforesaid under rules and regulations prescribed by the governing board of the station. The performance of ordinary farm operations by an experiment station does not constitute experimental work. Operations of this character by an experiment station should be confined to such as are a necessary part of experimental inquiries. Carrying on a farm for profit or as a model farm, or to secure funds which may be afterwards devoted to the erection of buildings for experiment station purposes, to the further development of experimental investigation, or to any other purpose however laudable and desirable, is not contemplated by the law as a part of the functions of an agricultural experiment station established under the act of Congress of March 2, 1887. Section 5 of that act plainly limits the expenditures of funds appropriated in accordance with said act to "the necessary expenses of conducting investigations and experiments and printing and distributing the results."

FUNDS ARISING FROM THE SALE OF FARM PRODUCTS OR OTHER PROPERTY OF AN AGRICULTURAL EXPERIMENT STATION.

This Department holds that moneys received from the sales of farm products or other property in the possession of an agricultural experiment station as the result of expenditures of funds received by the station in accordance with the act of Congress of March 2, 1887, rightfully belong to the experiment station as a department of the college or other institution with which it is connected, and may be expended in accordance with the laws or regulations governing the financial transactions of the governing board of the station, provided, however, that all expenses attending such sales, including those attending the delivery of the property into the possession of the purchaser, should be deducted from the gross receipts from the sales and should not be made a charge against the funds appropriated by Congress.

LIMIT OF EXPENDITURES OF EXPERIMENT STATIONS DURING ONE FISCAL YEAR.

This Department holds that expenses incurred by an agricultural experiment station in any one fiscal year to be paid from the funds provided under the act of Congress of March 2, 1887, should not exceed the amount appropriated to the station by Congress for that year, and especially that all personal services should be paid for out of the appropriation of the year in which they were performed, and that claims for compensation for such services can not properly be paid out of the appropriations for succeeding years. The several appropriations for experiment stations under the aforesaid act are for one year only, and officers of experiment stations have no authority to contract for expenditures beyond the year for which Congress has made appropriations.

This is plainly implied in the act aforesaid, inasmuch as section 6 provides that unexpended balances shall revert to the Treasury of the United States, "in order that the amount of money appropriated to any station shall not exceed the amount actually and necessarily required for its maintenance and support." The annual

financial report rendered in the form prescribed by this Department should in every case include only the receipts and expenditures of the fiscal year for which the report is made.

EXPENDITURES BY AGRICULTURAL EXPERIMENT STATIONS FOR A WATER SYSTEM TO BE CHARGED UNDER "BUILDINGS AND REPAIRS."

This Department holds that expenditures by agricultural experiment stations from the funds appropriated in accordance with the act of Congress of March 2, 1887, for the construction of wells, cisterns, ponds, or other reservoirs for the storage of water, and for piping, and other materials for a system of storing and distributing water, are properly charged, under abstract 18 in the schedule for financial reports prescribed by this Department, as being for improvements on land which have hitherto been held to come under the head of "buildings and repairs." The fact that a water system may be a necessary adjunct of certain experimental inquiries does not affect the case, inasmuch as the limitations on expenditures for improvements contained in section 5 of the act of Congress of March 2, 1887, expressly stipulate that these improvements shall be such as are necessary for carrying on the work of the station.

EXPENDITURES BY AGRICULTURAL EXPERIMENT STATIONS FOR MEMBERSHIP IN AGRICULTURAL AND OTHER ORGANIZATIONS.

This Department holds that membership fees in associations and other organizations are not a proper charge against the funds appropriated by Congress in accordance with the act of March 2, 1887, except in the case of the Association of American Agricultural Colleges and Experiment Stations, which is held to be an essential part of the system of experiment stations established under said act.

THE BORROWING OF MONEY TO PAY THE EXPENSES OF AGRICULTURAL EXPERIMENT STATIONS.

This Department holds that experiment station officers have no authority to borrow money to be repaid out of appropriations made under the act of Congress of March 2, 1887, and that charges for interest can not properly be made against funds appropriated under that act.

A. C. TRUE, *Director.*

Approved:
J. STERLING MORTON, *Secretary.*
WASHINGTON, D. C., *March 10, 1896.*

THE USE OF EXPERIMENT STATION FUNDS FOR COLLEGE PURPOSES.

This Department holds that no portion of the funds appropriated by Congress in accordance with the act of March 2, 1887, can legally be used, either directly or indirectly, for paying the salaries or wages of professors, teachers, or other persons whose duties are confined to teaching, administration, or other work in connection with the courses of instruction given in the colleges with which the stations are connected, or in any other educational institution; nor should any other expenses connected with the work or facilities for instruction in school or college courses be paid from said fund. In case the same persons are employed in both the experiment station and the other departments of the college with which the station is connected a fair and equitable division of salaries or wages should be made, and in case of any other expenditures for the joint benefit of the experiment station and the other departments of the college the aforesaid funds should be charged with only a fair share of such expenditures.

A. C. TRUE, *Director.*

Approved:
JAMES WILSON, *Secretary of Agriculture.*
WASHINGTON, D. C., *October 25, 1897.*

ANNUAL REPORT OF THE ALASKA AGRICULTURAL EXPERIMENT STATIONS FOR 1901.

By C. C. Georgeson, *Special Agent in Charge.*

The leading features of the Alaska investigations during the year 1901 have been the further clearing and improving of land, the growing of experimental crops, the opening of the station at Rampart, on the Yukon, the distribution of seed, and a reconnoissance of the region between Eagle, on the Yukon, and Valdez, on Prince William Sound. We have, in addition, as heretofore, superintended the meteorological observations along the Alaska coast.

At Sitka but little more land has been cleared, but a good deal has been done toward the improvement of that already cleared. At the Kenai Station likewise additional land has been cleared, broken, and put in condition for culture, and at the Rampart Station as much land was cleared as one man could get in condition in time for spring planting.

The experimental croppings have been chiefly directed toward ascertaining what can best be grown in this climate, and how crops should be treated for the best results. By the distribution of small packages of seed grain to persons who seemed likely to undertake the work an effort has been made to have the common hardy cereals tested over as wide an area as possible. However, but very few reports from these volunteer experiments have been received at this writing. Garden seeds and some flower seeds have also been distributed to about 500 persons in the Territory, who either are or ought to be interested in the development of agriculture. The seed distributed is much appreciated for the reason that it is a difficult matter for settlers anywhere, except along the seacoast, to obtain seeds.

The examination of the interior from Eagle to Valdez, with a view to get information in regard to its agricultural possibilities, the writer regards as an important piece of work preliminary to the opening of one or more stations in that region. A detailed report on the subject is submitted herewith (p. 283).

The season has, on the whole, been unfavorable. Of the four years during which work has been in progress, this has been the worst. The spring and early summer were abnormally dry, which retarded the growth of crops, and the latter half of the summer and the entire fall have been abnormally wet, which prolonged the growth and made

it difficult to harvest the grain after it was grown. But in spite of these drawbacks the results may be justly said to be satisfactory, especially here at the headquarters station. We have matured rye, wheat, barley, oats, and buckwheat, and successfully grown all the leading hardy vegetables. At the Kenai and Rampart stations the experiments have also been successful in a large measure, and our knowledge of the agricultural possibilities of the Territory has been materially extended.

There are many things that it was planned to accomplish this year which have not been done for want of funds to work with. The headquarters building at Sitka has not been completed, as was planned. Only the lower story is in condition for use. The porch has not been built, no heating plant has been put in, and the foundation between the piers on which the house rests has not been built up. Nor has anything been done toward equipping a laboratory with apparatus for simple chemical and botanical work. Likewise nothing has been added in the line of implements, work animals, or other live stock, all of which must be supplied before it is possible to do creditable work along scientific lines.

On the other hand, three much-needed buildings have been put up, namely, a barn and a small cottage at the Sitka Station, and a log building at the Kenai Station, which is intended for the combined purposes of a dwelling for the superintendent and a storehouse for seed, grain, and other articles that should be well protected. None of these buildings has been entirely completed at this writing.

WORK AT SITKA STATION.

There are now 4 acres of new ground under culture at the Sitka Station, and 2 acres more have been cleared and thoroughly ditched preparatory to being underdrained. It should be noted, however, that while the ground is under culture it is not thoroughly subdued. It takes time and tillage to bring the new, raw land into a thoroughly satisfactory condition. Aside from the station land, I have had the use of three lots in the town of Sitka, which belong to the Russian Church, and which aggregate about an acre and a half in area.

EXPERIMENTAL CROPS.

The following varieties of grain were grown the past season. The leading characteristics of each are brought out in the notes on its habit and growth.

RYE.

Swedish winter.—One of the lots in town belonging to the Russian Church was seeded to wheat on October 3, 1900. The seeding was late, for the reason that the growing crops had first to be removed,

there being no other available land. It was sown in a poor, gravelly soil containing very little plant food, and it was therefore necessary to give it a dressing of fish guano at the rate of 300 pounds to the acre. Many varieties of wheat were sown, but not one of these survived the winter. The Swedish winter rye was the only kind that came through alive. Owing to the late seeding it did not make much growth in the fall; it was in rather weak condition in the spring and the early growth was slow. By June 15 it had reached the height of 22 inches, and was then beginning to head. By June 24 it was two-thirds headed. July 1 it was all headed out and beginning to bloom. July 18 it was 4 feet 9 inches high, and part of it still in bloom. August 1 the grain was all formed, and August 15 it was in the dough. September 15 it was ripe, and was harvested on September 17. As noted, the soil was poor and the yield was not heavy. The value of the experiment lies wholly in the fact that it was a winter grain and survived the winter uninjured.

Although the winters are not severe on the coast, they are, nevertheless, trying on winter grains when the snowfall happens to be light. Last winter there was not to exceed 1 foot of snow on the ground at any time, and it did not last more than two weeks at any time. The frequent thawing and freezing of the ground were the cause of winterkilling of the wheats above noted and not the cold weather.

WHEAT.

Romanow spring.—This is the only variety which was seeded this year. Of the several kinds which have been tested this has uniformly given the best results, and this point settled, it did not seem wise to continue an endless variety test. The wheat was originally imported from Russia by the United States Department of Agriculture in 1897. It is a brown bearded wheat with a red berry. The qualities which commend it for cultivation in Alaska are that it matures early, stands up well, and is a good yielder. Its milling qualities have not been tested. Three small plats were seeded to this wheat, two of them being on the lots in town, the third on new ground on the farm. The two plats in the town lots were seeded May 8 and the plat on the new ground on the farm May 11. All plats were up May 27. On June 15 it was 10 inches high on the old ground and only 5 inches high on the new ground. July 1 it was 22 inches high on the old ground and only 1 foot high on the new ground. The stand in both cases was fairly good. July 18 it was 2½ feet high on the old ground and three-quarters headed; it was 20 inches high on the new ground and the heads just beginning to show. August 1 it was 3 feet high on the old ground and just passing out of bloom; on the new ground it was 34 inches high and still in full bloom. It should be

explained here that the old ground was gravelly soil, and therefore of the quality described as a "warm" soil, while the new ground was largely vegetable mold, containing much organic matter only partly decayed. The soil held moisture better during the dry season of the summer, but on the other hand it was not so warm. This explains the fact that the wheat on this ground was later in developing.

August 15 the wheat on the old ground was in the milk; on the new ground it was now 42 inches high and not entirely out of bloom. September 17 the wheat on the old ground was cut, but the wheat on the new ground was not harvested until October 3.

Almost continuous rain during the latter part of September and all of October rendered it difficult to cure this and all other grain. Advantage was taken of every rainless day to put the grain under shelter in the upper story of the barn where the wind has a clean sweep through, and by this means it was finally dried enough to thresh; but the wet weather discolored both the straw and the grain.

BARLEY.

Manshury.—A plat of this variety was seeded on new ground May 22. It was located on a little knoll which had been graded down in order to facilitate cultivation. This process exposed the subsoil, a red compact soil, apparently of volcanic origin. This red subsoil is absolutely sterile and it was therefore manured with barnyard manure, refuse silage, and a little fish guano, all three being mixed together and plowed under. The result was an excellent crop of barley. Seeded May 22 it came up June 7; was 3 inches high June 16; 1 foot high July 1; 2 feet 2 inches high July 18 and heading out; 3 feet high August 1 and in bloom. August 15 the grain was in the milk. On August 26 part of it was ripe and harvested. That portion which was not ripe grew in heavily manured spots, and the season of growth was therefore prolonged.

Sisolsk.—This variety was introduced by the Department of Agriculture from Russia. The seed here used was grown at the Sitka Station in 1900. A plat was seeded on new ground May 22. It was up June 7. June 15 it was 3 inches high. July 1 it was 8 inches high. The stand was very uneven owing to the quality of the new ground. July 18 it was 2 feet high and just beginning to head out. August 1 it was 32 inches high, fully headed and beginning to bloom. August 15 it had passed out of bloom and the grain was in the milk. September 4 it was ripe, but owing to continual rainy weather it was not harvested until September 24. As I remarked in last year's report, I consider this a promising variety. The straw is stiff and stands up well during storms. It is a six-rowed variety with large heads.

Manchuria.—A variety of barley obtained from the Minnesota Experiment Station. It resembles the Manshury so closely that it is difficult to distinguish one from the other. It was seeded May 22 on

new ground, on a plat located alongside of the two foregoing. On June 15 it was 3 inches high, with a good stand. July 1 it was 8 inches high, and owing to the new ground it was very good in spots and very poor in other places. July 18 it was 2 feet high and heading out and some heads in bloom. August 1 the best of it was 3 feet 6 inches high. August 15 it was 4 feet high and the grain in the milk. September 4 it was ripe and harvested. Certain spots, where the growth was excessive, were still green at this date. It is a promising variety for Alaska, and about equal to the Manshury in both earliness and productiveness.

Lapland.—The seed was imported under this name from Lapland by the United States Department of Agriculture. Seeded May 15, on new ground, it was up May 27. June 15 it was 4 inches high with a good stand and a good healthy color. July 1 it was a foot high and looked well on one-half the plat; the other half was stunted, owing to the character of the new ground. July 18 it was 28 inches high and nearly all headed out, beginning to bloom. August 1 the grain was formed. August 15 the grain was in the milk and August 26 it was ripe and harvested. This is the earliest variety of barley that we have found and it is apparently well suited to Alaska. The straw is short and the heads not large, but it stands up well and as here shown matures early. It is a so-called four-rowed variety.

Black Hulless.—A plat of this variety was seeded May 22 on new ground. It was up on June 7. On June 15 it showed a rather light stand and was 5 inches high. July 1 the growth was spotted, owing to the character of the new ground, the best of it 8 inches high. July 18 it was 20 inches high and a few heads showing. August 1 the best was 2 feet 6 inches high, beginning to bloom. August 15 it was 34 inches high and the grain forming. September 4 it was ripe, but owing to the continuous rain it was not harvested until September 23. This well-known variety is not a large yielder, but its earliness recommends it for use in Alaska. Moreover, the naked kernels make it possible for the Indians to use it in their primitive ways of cooking without being milled. For this reason I recommend that it be introduced in Indian communities. Our experiments have proved that it can be grown successfully in Alaska, and if the Indians were made familiar with its qualities, it ought to become popular among them as an addition to their very limited list of foods.

Chevalier.—The plat of this two-rowed variety was seeded on old ground in one of the town lots May 7. It was slow in coming up and made a poor growth all through the season. On June 15 it was only 3 inches high. July 1 it was 6 inches high. August 1 the best of it was 20 inches high. August 15 the best was 26 inches high and just beginning to bloom. This variety did not ripen. It can not be recommended for Alaska.

OATS.

Burt Extra Early.—One of the town lots was seeded to this variety May 9. The ground had been cultivated for years. It was up on May 18. On June 15 it was 3 inches high and the stand was excellent. July 1 it was 18 inches high and very promising. July 18 it was 30 inches high and almost entirely headed. August 1 it was 34 inches high and just past blooming. August 15 it was 3 feet high, the grain in the dough, and some of it beginning to ripen. It was ripe on August 26 and harvested on August 30. This is one of the most promising varieties of oats that we have tried. It has never failed to mature, and it can be recommended for all sections of Alaska, wherever grain can be grown. It is not a vigorous grower, nor does it yield as heavily as many of the later sorts. Its earliness is its chief recommendation.

North Finnish Black.—The station was supplied with about 2 bushels of seed of this variety. It was imported from Finland by the United States Department of Agriculture. Its origin would lead one to conclude that it would prove to be a very early variety. This, however, was not the case. It was seeded on new ground May 22. On June 7 it was up; on June 15, about 3 inches high, and the stand was excellent. July 1 it was 8 inches high, and the growth was spotted, good in places, poor in others, owing to the character of the new ground. July 18 it was about one-fourth headed and the best 2 feet high. August 1 it was 3 feet high and beginning to bloom; August 15, still in bloom, and the best of it had lodged. It does not seem to stand up well. Some of it was forming seed. Many of the plants continue to send out new shoots from the roots, so that it is in all stages of growth, some sprouts a few inches high, some of it heading, while the earliest is forming grain. September 10 there were many mature heads in the plat, but it was so uneven it could not be harvested. September 24 some of the ripest was cut, but the greater portion was still green. It should be noted that the ground is not well suited to variety tests. It was new and of uneven quality, but as far as results of this experiment would indicate, this variety has nothing to recommend it for Alaska above many other sorts of medium early oats.

FERTILIZER EXPERIMENTS WITH OATS.

With a view of testing the effectiveness of certain available fertilizers on new ground, six plats were laid out, each one-twentieth of an acre in extent, 1 rod wide by 8 rods long. The plats were treated as follows: Number one was fertilized with seaweed at the rate of 30 tons to the acre plowed under. Number two was fertilized with stable manure at the rate of 30 tons per acre. Number three was fertilized with fish guano from the Killisnoo factory at the rate of 500 pounds per acre. Number four was fertilized with 30 tons of seaweed plowed

under and 500 pounds of guano sown broadcast after plowing. Number five was fertilized with stable manure at the rate of 30 tons per acre plowed under and 500 pounds of fish guano per acre scattered broadcast after plowing. Number six was not fertilized. May 22 all of these plats were seeded broadcast with Finnish Black oats (the station does not own a grain drill). On June 7 all plats were up and showed no appreciable difference in color or growth. On June 15 there was a decided difference in the appearance of the plats. They ranked as follows in order from the best to the poorest: First, manure and guano; second, seaweed and guano; third, manure; fourth, seaweed; fifth, guano, and sixth, nothing. The manure and guano plat made the best showing. The growth was 4 inches high. From this the plats ranged down to an inch and a half. July 1 the several plats still ranked in the same order. The manure and guano plat has an excellent stand; the oats are very even and 10 inches high. The seaweed and guano plat is not quite so good; the stand is somewhat uneven and the growth 9 inches high. The same ratio holds good for the others, except the plat with no fertilizer. Here the crop is but 3 inches high and beginning to turn yellow.

July 18 the same rank was still maintained for the several plats. The plat fertilized with manure and guano was the best, the crop even and 2 feet high. The plat without any fertilizer was the poorest; the crop was uneven—in places entirely dead—and the best only 5 inches high. August 1 the same rank was still maintained. The height of the crop on the several plats was as follows: Manure and guano, 40 inches; seaweed and guano, 36 inches; manure (only), 30 inches; seaweed (only), 20 inches; guano (only), 20 inches. No fertilizer had by this time a very poor stand, and the best plants were only 12 inches high.

August 15 the fertilized plats ranked as before; all were in bloom, and the oats were lodging in spots. All the manured plats exhibited the characteristics noted in the description of the variety test referred to above, namely, that of sprouting from the roots. The storms which set in about this period beat the grain down. The earliest heads lodged and did not fill well. By September 10 some of it was ripe, but it would have been difficult to gather the ripe grain from the green suckers, and it was therefore left to be cut for hay. But almost incessant rain during September and October made it impossible to cure hay, and the plats were therefore not cut until November 1. When dry enough to be weighed the yield of hay for the several plats was at the following rates per acre: Plat fertilized with stable manure and guano yielded 1.67 tons; manured with seaweed and guano, 1.63 tons; fertilized with stable manure only, 0.8 ton; fertilized with seaweed only, 0.6 ton; with guano only, 0.6 ton, and with no fertilizer, nothing—only a few pounds.

The experiment simply proves in an emphatic way a fact which I have endeavored to point out in every report, namely, that new cleared and broken land is unproductive unless it is fertilized. It seems to lack available plant food, and it does not become productive until, by cultivation and exposure to the air, the inert plant food becomes available.

Prospectors and others who clear a piece of new ground and scatter a few seed are very generally disappointed in the result, and as a rule they blame the climate for their failure. The trouble lies in the fact here noted more than with the climate.

OATS AND PEAS.

All the new ground which was cropped for the first time this season was seeded to oats and peas. Fish guano at the rate of 300 pounds per acre was sown broadcast after the ground was plowed, and the grain was also broadcasted. Oats and peas mixed were grown, partly because we have found that no other crop does as well on new, raw ground, and partly because the crop was needed for feed. The crop was uneven in stand and in growth, as it always is the first year or two on new ground, but on the whole it was quite satisfactory. The seed was not of selected varieties, but common oats and field peas, such as are offered for sale for feed. Seedings were made at several times from the first to the middle of June as the ground was gotten ready. We began cutting the crop for feed in the middle of September, and from that date until the 2d of November it was fed daily to the work oxen. The oats in the early seedings matured.

BUCKWHEAT.

Orenborg.—The station was supplied with a small quantity of seed which had been imported from Russia by the United States Department of Agriculture. A small plat was seeded May 22 on new ground. June 15 there was a good stand, but it had made but little growth, and the same applies to the condition July 1. On July 18 it was 12 inches high and blooming profusely. On August 1 the earliest blossoms had formed seed and it continued to bloom profusely. August 15 the first-formed grain began to harden. It was ripe September 5. This variety of buckwheat and also a so-called Finnish buckwheat, likewise imported by the United States Department of Agriculture, can be grown successfully in Alaska. But Japanese buckwheat and Silver Hull buckwheat, favored varieties in the States, have quite generally been failures at the Alaska stations.

FLAX.

Riga.—A small plat of new ground was seeded to flax of this variety in order to test the soil rather than the flax. The same variety was

grown at the station in 1899 on old ground with marked success. It then attained the height of 3 feet, produced a fiber of good quality, and matured seed; but on new ground it is not a success. The crop was stunted, the best not attaining 1 foot in height. This result was expected under the circumstances.

VEGETABLES.

Small plats were planted with the following kinds: Cabbage—Early Jersey Wakefield; cauliflower—Early Snow Ball, Extra Early Paris; kale—Scotch Curled; Brussels sprouts—Improved Dwarf; kohl-rabi—Large White; peas—Earliest of All; beans—Broad Windsor, Golden Wax, Early Valentine; carrots—Half Long Scarlet; parsnips—Hollow Crown; beets—Early Egyptian; onions—Yellow Danvers; turnips—White Milan; garden cress; mustard—White London; celery—White Plume; celeriac.

These were grown in small plats, both on old ground and on new. On the old ground the results were highly satisfactory. I have never seen better kale, cabbage, Brussels sprouts, or cauliflower than were grown on a little corner of old ground at the base of Castle Hill. Some of the cauliflower heads measured 14 inches in diameter. The celery and celeriac were likewise good, and so were carrots, parsnips, and the other root crops.

On new ground, on the contrary, all these vegetables were but little short of failure, and had they been grown on new ground only, one might seemingly have been justified in stating that they could not be grown in Alaska. This is simply further proof of the oft-repeated fact that it requires some years to bring the soil into condition for satisfactory growth of crops of any kind.

I do not consider it necessary to carry out extensive experiments in the cultivation of vegetables. That all the common, hardy kinds can be grown to perfection in Alaska has been demonstrated so repeatedly in nearly every part of the Territory, in the interior as well as on the coast, that there is no further need of proof. The experiment stations should hereafter grow vegetables with a view to test the different methods of culture. The new ground at the Sitka Station is not yet in sufficiently good condition for that line of work.

For detailed results in the growth of vegetables elsewhere, I respectfully refer to the letters from people who have received seed from the experiment station, which are submitted herewith (pp. 316–336). For Sitka the letter from Mrs. George Stowell gives full details of crops grown in her garden the past season, and her experience is duplicated by dozens of others.

POTATOES.

Pride of North Dakota.—A corner of new ground, cropped for the first time this year, was planted to potatoes of this variety. None

were planted on old ground. The seed was grown at the station in 1900 and kept over winter in perfect condition. The first row was manured with seaweed at the rate of 30 tons per acre. The second was manured with fish guano, at the rate of 500 pounds per acre, and the third row was not fertilized. The fourth was manured with seaweed again, and so on through the whole patch. Although the crop was but light and can scarcely be called a success, the experiment is nevertheless of interest, because it shows that seaweed, so abundant everywhere along the coast, is an excellent fertilizer for potatoes. The guano, likewise, showed its effect, but not to the same degree. The rows which were not fertilized produced practically no potatoes. The ground was a vegetable mold which would ordinarily be considered rich, and with continued cultivation it will be productive in two or three years.

SMALL FRUITS.

Cuthbert raspberries.—Some plants were obtained from an old plantation, in Governor Brady's garden, and transplanted to a corner at the base of Castle Hill. The plants grew with great vigor and in spite of having been transplanted produced berries from the beginning of August until frost. The red raspberry is indigenous to Alaska, and flourishes in the coast region to perfection, and it can also be grown along the Yukon River.

Red currants.—I have obtained a few bushes by purchase and also procured cuttings from neighbors. These are doing well. It is the intention to use them for propagation if the proposed nursery is established. None of the station bushes has borne fruit, but vigorous bearing bushes can be found in nearly every garden in Sitka and other coast towns. The same may be said of the black currant.

Gooseberries.—Gooseberries are less common than currants, but they do well everywhere in the coast region. A few bushes have been procured with a view to use them for propagation.

NEW STATION BUILDINGS.

A NEW BARN.

The past year we have built a barn at the station 25 by 50 feet in dimensions and two stories high. The lower story is built of logs and the second story is frame. An illustration is submitted herewith. (Pl. VIII, fig. 1.) The logs were cut in the winter of 1899 and 1900, but there was not snow enough on the ground that winter to enable us to haul them out of the woods. During the past winter there was snow enough to haul them for only two weeks and the marshy ground over which we had to drive was not frozen solid for a much longer period, which proves incidentally that the winters are not severe at Sitka. The barn is not entirely completed at this writing, but the

FIG. 1.—ALASKA STATIONS—BARN AT SITKA.

FIG. 2.—ALASKA STATIONS—NEW COTTAGE, SITKA.

work on it is sufficiently advanced so that it is in use. The lower story is intended to be used for a stable, for the housing of implements, and a tool room for hand tools. The second story is designed to be used exclusively for the storing and handling of grain. To this end it is provided with a tight floor and, as may be seen in the illustration, there are large doors on both sides. These doors are intended to provide a free circulation of air, so the barn floor can be used as a place to dry grain in the protracted rainy season. It is a bank barn, with a driveway on the north side about 6 feet higher than the floor of the lower story. This facilitates the unloading of grain in the second story. It will be seen that it is connected with the silo, which is filled from the same driveway.

BUILDING A FARM COTTAGE.

Pl. VIII, fig. 2, illustrates a little two-story cottage which has been built on the farm in order to enable a man to live permanently on the place. The interests of the work require that there be constantly someone on the farm. The building is 30 by 14 feet, and when completed it will have two rooms and a kitchen below and two rooms above.

Both the barn and the cottage were built by Assistant Rader with such help as was hired on the farm. The financial outlay for these buildings amounts to little more than the price of the materials.

DRAINAGE.

In former reports attention was called to the necessity for thorough underdrainage of all low-lying ground, and also to the fact that portions of the cleared land had been underdrained with brush drains; that is, the ditches were filled with small brush, carefully packed in at an angle, and in such a way as to leave interstices through which the water can pass. These drains have given satisfaction so far. Their durability is the only doubtful point.

I believe we have discovered an improvement on the brush drain by the partial substitution of slabs for brush. Slabs are the first, or outside, cut of logs which are cut up for lumber in the sawmills. These slabs can be had very cheaply. They have been obtained in the past for 50 cents a load of about twenty-five pieces. When the bottom of the ditch is in firm ground, two slabs set on edge and leaned against each other in the form of an A will make a good conduit for the water. The two pieces are held securely together by a nail here and there where the two edges meet, and there will always be abundant openings for the water to get through. On top of this conduit are packed, first, poles, then coarse brush, and, finally, smaller brush, and on top of the brush, first sod and then earth. The materials cost but little for a drain of this kind; it is chiefly a matter of labor.

When the bottom of the ditch is soft, two slabs are put together in the shape of a V, in the middle of the ditch, and a third slab is nailed on top so as to leave a triangular water passage. On top of this are packed poles and brush as before. The writer believes that this kind of drain will last for many years. Slabs can usually be procurred from sawmills everywhere, and as the mills multiply settlers can procure them in many instances near by their farms.

At the Sitka Station we are experimenting in this manner, with the drainage of about 2 acres of peaty soil. The object is to see what the productiveness of such a soil is when brought under culture. There are extensive areas of peat in Alaska, and it is important to know if such land has any agricultural value. In this instance it was found necessary to place the drains 15 feet apart. The work is not completed at this writing.

NATIVE GRASS FOR SILAGE.

I stated in my last report that the log silo which was built in the summer of 1900 had been filled with native grass. It gives me pleasure to report now that this experiment was a complete success. The silage kept well in this log structure and made a feed of good quality. Our oxen were fed on it almost exclusively during the past winter. They ate it readily and kept in fair condition. They were given a little grain in addition only when they were worked. On the top and around the sides there was a certain amount of decayed silage, but no more than is found in all cases when green forage is packed away. We found that this waste silage had some value for manure on certain plats of soil. The grass was cut on a natural meadow skirting a bay some distance from Sitka, where it grows in abundance. It was then loaded into a scow and the scow was hauled to the beach at the nearest point to the farm by our steam launch. The grass was 2½ to 3 feet in length. It was thrown into the silo and tramped down at intervals during the process of filling. It settled into a very compact mass which was removed when wanted for feed by slicing it down with a hay knife.

During the latter part of August and the beginning of September of the present year the silo was again filled in the same manner, and as before it has resulted in a fine quality of feed. Not only will native grasses make good silage, but our log silo demonstrates the fact that it is not necessary for the farmer to go to great expense in building a silo. He can himself build one of logs. The logs should, however, be dressed on the inside and laid so as to make a nearly smooth wall. They should be fitted well upon one another and the openings between them should be chinked with moss, clay, or mortar in the usual manner.

FIG. 1.—ALASKA STATIONS—STATION BUILDING, KENAI.

FIG. 2.—ALASKA STATIONS—RECENTLY CLEARED LAND, KENAI.

WORK AT KENAI STATION.

On June 2 I left Sitka on the steamer *Newport*, for the westward, with a view to first visit the experiment station at Kenai on Cook Inlet, and then go to Unalaska, and from there to St. Michael and up the Yukon River in the interest of these investigations. The steamer *Newport* touched at Homer and Seldovia, at the mouth of Cook Inlet, but did not go up to Kenai. I had expected to reach Kenai from Homer on some passing boat, but there appeared to be very little traffic on the inlet. I waited a week at Homer without an opportunity to go up. The Cook Inlet Coal Fields Company, who own all the improvements at Homer, kindly accommodated me with quarters during this enforced stay, which was duly appreciated, as I was not provided with a camping outfit. At the end of a week I felt compelled to hire a sailboat in order to reach my destination. I induced the owner of a small sloop, which was put to sea on the high June tide, after having been on dry land all winter, to take me up there. We reached Kenai after a somewhat adventurous sail of two days and nights. The wind was unfavorable and the tides are so swift in the Inlet that the boat was at times carried back almost as fast as it had advanced.

I found the work at the Kenai Station advancing favorably. Mr. H. P. Nielsen, who has been in charge of the station from the beginning, deserves much credit for the amount and quality of the work which he has accomplished. Except for a few days on special occasions he has never had more than one man to help him, and most of the time he has been alone. He has built a barn and silo, both of logs. He has also built a station building intended for quarters for the superintendent and also to furnish storage room for seeds and specimens. A photograph of this building as it appeared at the time of my visit is reproduced in Pl. IX, fig. 1. The building was not finished at that time, but it has since been completed. He has cleared, fenced, and put under culture about 6 acres of land and more ground is cleared, off and on, whenever time can be spared from work required by the growing crops. (Pl. IX, fig. 2.) There has been but one yoke of oxen at the Kenai Station and one of these is getting old and gradually giving out. To replace him I bought a yearling from one of the residents and turned him over to Mr. Nielsen's care. Oxen are, in my judgment, the most satisfactory work animals for the pioneer Alaska farmer. The station oxen at Kenai live wholly on native feed, and are, therefore, maintained at practically no cost, except the labor of providing the feed. For stump pulling, plowing new ground full of roots, etc., oxen are far superior to horses. We have worked the oxen at Kenai in harness from the beginning. The yoke is used only to

keep them together. The harness is easier on them than the yoke and they can, therefore, get through with more work. I took a photograph of the oxen with their harness, and as it may be of service to other pioneer farmers, it is reproduced in Pl. X, fig. 1. The arrangement is very simple. It consists of a collar over which a pair of hames are buckled. A backband supports the traces and a strap under the chest holds them in place. Chains are used for traces. I bought this harness in Seattle, made to order at a cost of $12 for the double set.

It has been our policy to gradually extend the clearing of land when time could be spared from other work. The timber is small and the task is not a difficult one, but the stumps are numerous, and it became necessary to devise some plan by which they could be pulled rapidly. The roots do not grow deep and it does not take great power to pull the average stump. A machine which was set up over the stump and worked by hand was first tried, but it proved to be too slow work, and it was too cumbersome to move. As a cheap and efficient means to aid in this work, I devised a simple stump-pulling tackle, consisting of two triple blocks and 300 hundred feet of 1-inch rope. One block is anchored to a solid stump and the other is attached to the stump it is desired to pull. When secured in this way the oxen are hitched to the rope and driven up slowly, and the stump usually comes out without trouble. The method of using this tackle is illustrated in Pl. X, fig. 2. Two men and a yoke of oxen pulled 6 stumps in fifty minutes while I was there. I mention this fact only to show that it is a simple and efficient machine.

The illustrations show the method of attachment when the stumps are cut high, or when they are very small. When the stumps are 12 inches in diameter, or when cut low so as to afford no leverage, we use a device of two timbers about 6 feet high, fastened together in the form of the letter A. To the top of this A is attached a chain or wire rope some 4 or 5 feet long and terminating in a hook. The A leans against one side of the stump and the hook is attached to a large root on the other side. The power is then applied to the top of the A, and as this is raised up the stump is tilted over. The device simply affords greater leverage than when the block is secured directly to the stump, as shown in the illustration.

The station had about 5½ acres in crops, most of which consisted of grain. Winter wheat and winter rye had survived the cold weather and came out in the spring in fair condition, though the stand was in no case the best. A full line of the hardy vegetables had been planted, but the cabbage and cauliflower had been nearly destroyed by insects, and it was then too late in the season to raise new plants. Other vegetables were fairly promising, and the spring-seeded grains looked well.

May and June had been unusually dry. During the month of June the rainfall measured only six one-hundredths of an inch. In conse-

FIG. 1.—ALASKA STATIONS—WORK OXEN, SHOWING HARNESS, KENAI.

FIG. 2.—ALASKA STATIONS—STUMP-PULLING TACKLE, KENAI.

FIG. 1.—ALASKA STATIONS—HAY MAKING, KENAI.

FIG. 2.—ALASKA STATIONS—MEADOW AT HOMER, KENAI PENINSULA.

FIG. 1.—ALASKA STATIONS—A PIECE OF CLEARING NEAR HOMER, KENAI PENINSULA.

FIG. 2.—ALASKA STATIONS—STATION BUILDING AT RAMPART, YUKON RIVER.

quence of this the crops were backward for the season. They were revived, however, by later rains. The result of the season's operations is given in detail in Mr. Nielsen's report, which is submitted herewith. Pl. XI, fig. 1, shows a view of a cart load of hay.

On the whole, the writer regards the prospects for farming on the Kénai Peninsula as very promising. The success of the work at the station has stimulated many of the natives, chiefly those of Russian descent, as well as the Indians, to raise gardens of their own, or to extend the area and increase the varieties grown in the case of those who had gardens before. Potatoes are grown very generally and very successfully everywhere in that region as their main crop, but they raise also cabbage, kale, turnips, lettuce, and radishes.

I found that I could not reach Unalaska except by waiting nearly a month at Homer for the next boat going westward, and this being impracticable, I decided to return to Sitka with the *Newport*. Through the kindness of Mr. Gompets, superintendent of the Kenai cannery, I got passage to Homer on one of the fishing steamers belonging to this cannery, and arrived there just in time for the eastward trip of the *Newport*.

I returned to Sitka, June 29, and finding that Assistant Director Allen, of the Office of Experiment Stations, would be there shortly, I decided to await his arrival before starting for the interior.

There is much good pasture land in the neighborhood of Homer. I present herewith a reproduction of a photograph of horses at pasture (Pl. XI, fig. 2). The hill country back from the beach affords also an abundance of pasture. The nature of the country is indicated somewhat by a photograph of a clearing near Homer (Pl. XII, fig. 1). The buildings in this clearing belong to the Cook Inlet Coal Fields Company.

There are enormous deposits of coal in this region. It crops out on the high bank facing the beach, several thick seams being exposed. It is said to be of good quality, and it has the peculiar property that, although it is a soft coal, it does not soil a white handkerchief. This coal deposit will doubtless play an important part in the settlement of the region.

MAIL FACILITIES FROM SITKA WESTWARD.

Before leaving this subject, I deem it my duty to mention that the mail service at Kenai, and in general between Sitka and the westward, is very inadequate. Mail is carried between Sitka and Kenai only once a month and the boat stops at Kenai only long enough to land the mail, so that it is impossible to get replies until the next mail boat. On the return trip east, the mail boat does not stop at either Kenai or Sitka. Letters addressed to the Kenai Station can not be answered for a month after their arrival, and then they are carried to

Juneau and left to be forwarded to Sitka by the next mail boat. It takes, therefore, two months to get a reply from the Kenai Station.

It would be greatly to the convenience of our work if the mail boat could stop at Kenai on her return from Tyonek, and stop at Sitka on her way to Seattle.

REPORT OF H. P. NIELSEN, SUPERINTENDENT OF KENAI STATION.

KENAI EXPERIMENT STATION,
October 5, 1901.

DEAR SIR: I hereby submit my report for this season's work.

The grain has not matured as well as it might have done, because its growth was retarded by dry weather last spring. The winter grains matured, however, as did also the barley and two or three varieties of oats. The spring wheats did not amount to anything this year.

You probably remember when you were here that none of the grains appeared to be sown too thickly. Well, this fall when the wet weather set in, for every straw there was previously, ten sprang up from suckering, and now in each one of these bunches, especially in the oats, there is the original straw in the center with ripe grains, and all of these shoots are from 6 inches to 1 foot taller than the original stalk, but green. And it has kept this up right along. All through the oats and Manshury barley there were young shoots not headed out yet, others just heading, some in bloom, and all the way up to ripe grain, but the latter is but a small percentage of the whole. All the grains suckered in this way until it was thicker than hair on a dog's back.

The flax also, as you will notice, from sample sent, acted peculiarly. The seed which germinated early produced plants, which branched considerably but were of no value for fiber, while that which came up in July reached a height of 2 feet or a little over, and has very fine straight straw.

The ground is fertile; what it wants is cultivation and water. When the rain came everything started to grow, and grew fast, so fast that in fact it would not stop growing until the frost stopped it.

I did not keep any record of the growth of the field peas, but all the patches on which the stand of grain was not good were sown to field peas June 21. On account of the ground being so dry they did not come up until about July 10, and some as late as the 15th. They then made a good vigorous growth, however, and were about 2 feet high and in bloom when they were cut for hay September 16 and 17.

BUILDING OF STATION HOUSE.

I started to cut logs for the house the latter part of last October. Logs have been cut for building houses here in Kenai for a hundred years, and all the handy timber has been cut away. By going back about 2 miles, though, I found house logs, but they were scattering.

After cutting the 140 logs which I needed, I had logs here and there over half a square mile. To collect them I made a small sled just wide enough for the big end of the log to lie on, and used one of the oxen to drag them together. After I had them all piled up, I cut a road wide enough for the big sleigh and hauled them home with both oxen; this took until New Year. I finished hewing them February 21, and in the first part of March hired C. H. March to help me lay them up. The house was so nearly completed by the last of June that we moved into it, and the remainder of the inside work has been done since on rainy days.

CLEARING LAND.

About 1½ acres additional land has been cleared this summer, stumps pulled, land plowed and disked, and it is now ready for cropping next year. This land is cleared about a quarter of a mile back in the woods, leaving a belt of timber between it and the sea. The southwest wind blowing up the inlet is always cold, and is thought to be a drawback to vegetation.

Sufficient hay for keeping the oxen and a yearling calf, bought this summer, has been cut and gathered during the summer. No grass has been put in the silo, chiefly because it is difficult to get grass near here, as the cattle have it pretty well pastured down. The wild grass which we use for hay grows some miles distant, and it is easier to transport the hay than the green grass.

EXPERIMENTAL GRAIN CROPS.

WINTER RYE.

Sisolsk.—A small plat of this rye was sown August 20, 1900, on new ground, which was fertilized with fish guano at the rate of 200 pounds to the acre; it came up in about ten days, and stood about 4 inches high when the ground froze. Stand uniform, but rather thin. On June 20 the stand was straggling and spotted; height 1 foot. July 1, growth straggling, some stalks 2 feet high, average 15 inches; beginning to head. July 15, 30 inches high, fully headed, and beginning to bloom. August 1, 5 feet high and in bloom; looks promising. August 15, average height 5½ feet, some stalks over 6 feet high, going out of bloom, but does not seem to be forming any seed; suckering badly. September 2, average height 6 feet, some heads going out of milk, some in the milk, and some blooming. September 16, heads white, only about 50 per cent have grain in them, straw mostly green; it was harvested September 26. At this time there were suckers in all stages, some just heading out, but the ripe straw was being broken down by strong winds. This is a new variety; the seed was imported from Russia by the United States Department of Agriculture.

WINTER WHEAT.

Sandomer.—A plat of this wheat was sown August 23, on same kind of ground as the rye. It came up in about 12 days and stood 4 inches high, when the ground froze. Stand good and uniform. On June 20 it was noted that the stand was good and uniform, 6 inches high. July 1, stand and color fairly good, 8 inches high. July 15, 15 inches high. August 1, 30 inches high, fully headed, and in bloom. August 15, 3½ feet high, still in bloom. September 2, some heads well advanced in the milk, new shoots numerous, and in bloom. September 16, lower half of straw turning yellow, heads also turning yellow. It was cut September 30. It was mostly ripe, but is not so early as the Yarasloff, and has more tendency to sucker. Seed was imported from Russia by the United States Department of Agriculture.

Yarasloff.—Sowed August 23, on the same kind of ground as the foregoing variety. It came up in about 12 days, and stood 4 inches high, when the ground froze. Stand good and uniform. On June 20, stand good and 6 inches high. July 1, stand and color good, 8 inches high; needs rain. July 15, 16 inches high, just beginning to head; promising. August 1, 36 inches high, fully headed, and in bloom. August 15, 4 feet high, going out of bloom, forming seed. September 2, in the dough, straw turning yellow, September 16, nearly ripe. It was cut September 30. The straw at this time was dry, but owing to continuous wet weather, the kernels were not quite hard. It wintered well, and on old ground and in ordinary seasons can be counted on to ripen. Seed imported from Russia by the United States Department of Agriculture.

SPRING WHEAT.

The following varieties of spring wheat were seeded May 10 and 11. Owing to the drought in spring and early summer they were slow in starting and in consequence the period of growth was shortened. None of them got fairly started to grow until the rain came, about the middle of July, and by the 1st of August they had scarcely begun to head. But from this date the excessive rain kept these wheats growing, and caused them to throw out shoots from the roots at such a rate that they formed but little grain. September 6 all were cut for hay. The varieties were Romanow, Russian, Pererodka, and Kubanka. All were imported from Russia, and all have been grown successfully at the Sitka Station. The Romanow matured at the Kenai Station in 1899.

BARLEY.

Manshury.—Seeded broadcast and harrowed in May 24 on both old and new ground, which had been given a dressing of 500 pounds of fish guano to the acre. On June 20 the stand was good, 3 inches high.

July 1, color good, but has made no growth on account of dry weather. July 15, 6 inches high, growing rapidly. Up to this time there is no difference between the growth on old and on new ground. August 1, stand uniformly 18 inches high, and 10 per cent headed on the old ground. On adjoining new ground, growth spotted, 6–30 inches high, rank spots headed. August 15, on old ground uniformly 2 feet high, fully headed; on adjoining new ground, stand 10 inches to 3 feet high, much of stunted growth not headed yet. September 2, on old ground 33 inches high; some in the bloom and some in the milk. On adjoining new ground, spotted, 15 inches to 3 feet high; rank spots in the dough, straw turning yellow. September 16, about one straw in ten with grain in the dough, the other nine-tenths are suckers, in all stages, some just heading out. On adjoining new ground, rank spots nearly ripe, stunted growth, some in the dough and some in the milk, straw green yet. It was cut October 4. Only the older heads were ripe; the suckers started too late to ripen.

Beartown.—Seeded in rows May 21 on old ground manured with fish guano at the rate of 500 pounds to the acre. On June 20, stand was good, 5 inches high. July 1, has made no growth for lack of rain. July 15, 10 inches high, running to stalk. August 1, growth spotted, 14–30 inches high, half of it headed. August 15, growth fairly uniform, 36 inches high, going out of bloom. September 2, in the dough, straw turning yellow. September 16, turning yellow and ripening. Cut October 5. This is the earliest variety of barley grown here. The only objection is that it sets too large heads for the strength of the straw. It lodges badly. It has large, plump grains. Grown from seed raised here in 1899.

Sisolsk.—Seeded in rows May 21, on same kind of ground as the Beartown. June 20, fair stand, 2 inches high. July 1, has made no growth, owing to the dry weather; turning yellow in spots. July 15, 4 inches high, yellow spots turning green again. August 1, 12 inches high, just beginning to head. August 15, 20 inches high, fully headed, about 20 per cent in bloom. September 2, 30 inches high, part of it in bloom and part in the milk, suckers numerous. September 16, about 20 per cent in the dough, the rest in all stages, straw green yet. It was cut October 5; suckers still green, early heads with firm grains in them.

Perm.—Seeded in rows May 21 on the same kind of ground as the two other varieties. June 20, stand good, 4 inches high. July 1, has made no growth on account of dry weather. July 15, 6 inches high, looks well, growing fast. August 1, 18 inches high, just beginning to head. August 15, 2 feet high and in bloom. September 2, average height, 33 inches, well advanced in the milk. September 16, in the dough and ripening. It was cut October 5. Grown from seed raised here in 1899.

OATS.

Burt Extra Early.—Sown broadcast at the rate of 2 bushels to the acre, May 24, on ground broken in 1899 and in oats last year. It was fertilized with fish guano at the rate of 500 pounds to the acre. June 20, stand fair, color good, 2–3 inches high, promising. July 1, 3–4 inches high, growing very slowly. July 15, average height 8 inches. August 1, 2 feet high, fully headed, looks promising, beginning to stool. August 15, 2½ feet high, beginning to bloom, suckers in all stages up to the heading out. September 2, well advanced in the milk, some in the dough. September 16, straw turning yellow, bids fair to mature. It was cut October 2; it was not all ripe, but a large percentage of it was; new suckers were growing up all the time.

White Russian.—Sown broadcast and covered with the harrow May 24 on new ground, which had been given a dressing of 500 pounds of fish guano to the acre. June 20, stand and color good, 3 inches high. July 1, 4 inches high, needs rain. July 15, 7 inches high. August 1, 15 inches high, beginning to head. August 15, 2½ feet high, fully headed. September 2, in the milk, standing up well. September 16, mostly in the dough, straw turning yellow and ripening. It was cut October 1; a good percentage of it was ripe. Probably the reason it stood up so well was, it was sown between the house and the woods; the house sheltered it from the south winds and the woods from the north. It was grown from seed raised here in 1899.

Siberian.—Sown broadcast May 23 on ground broken in the spring of 1900 and grown to oats last year. It was manured with fish guano at the rate of 500 pounds to the acre. June 20 the stand was fair, 2 inches in height. July 1, has made no growth. July 15, stand improved some, 6 inches high, color good. August 1, uniformly 12 inches high, a few heads showing. August 15, 20 inches high, not all headed yet. September 2, 3 feet high, about 50 per cent of it in the milk. September 16, about 40 per cent in bloom yet, 50 per cent in milk, and 10 per cent in dough, straw green. It was sown too thin, and when the wet weather set in it suckered, which accounts for the different stages. In some cases 12 straws had sprung up around the original one. It was cut October 1; only the earliest heads were ripe.

Improved Ligowo.—Seeded in rows May 16 on new ground manured last fall with fish guano at the rate of 300 pounds to the acre. June 20, stand and color good, 3 inches high. July 1, the most of it has made no growth; in spots it is 7 inches high, needs rain. July 15, growth spotted, average 8 inches high, spots 12 inches high. August 1, average height 18 inches, one-half headed. August 15, fully headed and in bloom, promising. September 2, 4 feet high, well advanced in the milk. September 16, in dough, straw turning yellow, chaff and hulls turning white. Cut October 3. This variety produces fewer

suckers than any other variety grown here; about 90 per cent of it ripened.

Black Finnish.—Seeded in rows May 22 on old ground manured with fish guano at the rate of 500 pounds to the acre. June 20, stand and color good, growth uniform, 3 inches high. July 1, color good, 4 inches high, growing a little. July 15, 7 inches high, uniform. August 1, 14 inches high, headed. August 15, 30 inches high, in bloom, promising. September 2, 3 feet high, in the milk. September 16, in dough, straw green. Chaff turning white and hulls black. Stands up well and bids fair to mature. It was cut October 5. The straw was not all yellow, but most of the grain is hard.

Tobolsk.—A plat was seeded in rows May 22 on old ground manured with fish guano at the rate of 500 pounds to the acre. Another plat was seeded broadcast May 24 on same kind of ground. On June 20 it was noted—rows, stand and color good, 3 inches high, promising; broadcasted, stand poor, 2–3 inches high. July 1, rows, stand and color good, 5 inches high; broadcasted, stand poor, had made no growth. July 15, rows, stand and growth uniform, 7 inches high; broadcasted, stand improved wonderfully. New stalks have come up since the rain, average 6 inches high, doing nicely. August 1, rows, stand uniform, 20 inches high, beginning to head; broadcasted, 1 foot high, no heads as yet. August 15, rows, 30 inches high, going out of bloom; broadcasted, 20 inches high, fully headed. September 2, rows, 3½ feet high, grain in the milk; broadcasted, suckering badly, few heads in the milk, some in bloom and some just heading. September 16, rows, grain in the dough, chaff turning white, straw green. This plat does not sucker much, and is uniform, will mature; stands up well; broadcasted, earliest heads in the milk, straw green, but the frost has turned the chaff white on all the heads. Will not mature any seed. This plat was cut for hay October 1; the straw was green and young shoots growing up all the time. The plat in rows was cut October 5. The straw was partly green, but about 75 per cent of the grain was ripe.

St. Petersburg.—Seeded in rows May 22 on old ground manured with fish guano, at the rate of 500 pounds to the acre. June 20, stand good, 2–3 inches high. July 1, has made no growth, but the color good. July 15, 5–7 inches high. August 1, stand uniform, 12 inches high, beginning to head. August 15, 2 feet high, fully headed and in bloom. September 2, 3 feet high, in the milk. September 16, 50 per cent in the dough, 50 per cent in milk; straw green, chaff on advanced heads turning white. It was cut October 5; only a small percentage of the grain was fully ripe; straw mostly green.

Zhelanni.—Seeded in rows May 21, on the same kind of ground as preceding variety. June 20, good uniform stand, 3–4 inches high. July 1, has made very little if any growth, color good. July 15, 7 inches high, growing fast. August 1, 12–20 inches high, about half

headed. August 15, the average height, 30 inches, going out of bloom. September 2, 3 feet high, in the milk. September 16, well advanced in the milk, a small percentage in the dough, with the straw turning yellow. It was cut October 5, straw mostly green, only a small percentage of firm grains. The seed was imported from Russia by the United States Department of Agriculture.

Banner.—Seeded broadcast, at the rate of 2 bushels to the acre, May 24, on both old and new ground, which had been given a new dressing of fish guano at the rate of 500 pounds to the acre. June 20, stand good, color excellent, 2 inches high. July 1, stand appears to have thickened some, but has made no growth upward. July 15, 6–8 inches high; up to this date there was no difference between growth on old and on new ground. August 1, on old ground, stand uniformly 14 inches high. On adjoining new ground, growth spotted, 6–24 inches high, no heads yet. August 15, on old ground, uniformly 20 inches high. On adjoining new ground, spotted, 8–30 inches high, stunted growth not headed, rank growth headed. September 2, on old ground, uniformly 4 feet high, mostly in bloom, some just past the bloom. On adjoining new ground, growth 18 inches to 4½ feet high, rank growth in the milk, stunted growth going out of bloom. September 16, on old ground, straw green, a small percentage in the dough, mostly in the milk. On adjoining new ground, rank growth, straw turning yellow, seed well advanced in the dough, stunted growth in the milk, straw green. It was cut October 3 and 4. Only a small percentage of grain was ripe, but the frost had turned the heads white. The straw was mostly green. On the old ground it suckered badly.

BUCKWHEAT.

Silver Hull.—Seeded in rows May 22 on ground broken in the spring of 1900 and seeded to oats last year. It had been fertilized with fish guano at the rate of 500 pounds to the acre. On June 20 it was noted just to be up, but sickly. July 1, about 20 per cent killed by drought, half the remainder drooping, and all looks sickly. July 15, 2 inches high, stand improved considerably since the rain, color fairly good. August 1, 8 inches high, in bloom, and looks fine. August 15, 1 foot high, still in bloom, no seed formed. September 2, in all stages, some in bloom, some seed just formed, and some in the milk. Killed by frost September 3, and cut September 13. I found when I cut it there was a small percentage of well-matured seed.

Japanese.—Seeded in rows, May 22, on same kind of ground as the preceding variety. It made slow growth all summer. August 1, 6 inches high, a few stalks in bloom. August 15, 8 inches high, blighted by cold wind, not looking well. Frost of September 3 killed it. It was a total failure.

Orenborg.—Seeded May 22 on same kind of ground as the other

two varieties. On June 20 only 40 per cent stand; looks sickly. July 15, stand improved since the rain. New plants coming up all the time. The few old ones not killed are beginning to bloom. August 1, spotted; 4 to 12 inches high, in full bloom. August 15, in bloom yet, some seed formed. September 2, in all stages, some blooming, seed just forming, and some seed ripe. It was killed by frost September 3, and harvested September 13. There was more seed on this variety than on the Silver Hull, but it was a partial failure.

EMMER.

Ufa spring emmer and *Yarasloff spring emmer* were tried. Seed of both varieties imported from Russia. Both matured at Sitka in 1899. The drought retarded their early growth and neither variety matured seed. Both were cut for hay September 26.

FLAX.

Riga.—Seeded May 23 at the rate of 2½ bushels to the acre, on old ground which had received a dressing of fish guano at the rate of 500 pounds to the acre. On June 20 it was just coming up. July 1, stand fair, 1 inch high. July 15, much of it is 4 inches high, much more is just coming up after the rain. August 1, first half 12 inches high, beginning to bloom; second half 3 inches high. August 15, first half 2 feet high, in bloom, branching considerably; second half 8 inches high. September 2, first half 30 inches high, with some blossoms and some seed pods; second half 15 inches high, just coming into bloom. September 16, first half seed pods turning black; second half 2 feet high, in bloom. Cut October 5; very little seed is ripe. The part that came up last set no pods, though it has fine, straight straw and exceedingly tough fiber.

CLOVER.

Red.—Seeded May 30, 1900. Growth last year but light; survived the winter well, June 20, the stand was excellent, but growth not remarkable so far, the average height being about 4 inches; promises well. July 1, has made scarcely any growth; a few stalks in bloom; suffering from the drought. July 15, average height 7 inches, half of it in bloom. August 1, spotted, 6–12 inches high, 75 per cent in bloom. August 15, mowed for hay; a fair crop of hay was cut. September 2, 6 inches high. October 5, still green, but no longer growing.

Red and *Alsike* (mixed).—Seeded May 23 on ground broken in 1899 and grown to oats last year. June 20 it was just coming up. July 1, stand uncertain. More of it coming up all the time. July 15, one-half inch high; stand good. August 1, 1 inch high. August 15, 1½

inches high; growing nicely. September 2, 4 inches high. September 16, 6 inches high. At this writing it is still green and seems to be growing. I regard it as being very promising.

FLAT PEA (*Lathyrus sylvestris*).

Seeded May 30, 1900, on new ground. On June 20 there were only a few plants showing above ground. Stand good last fall. July 1, stand fair, 2 inches high; growing very slowly. July 15, 6 inches high. September 2, growth becoming spotted, 6–10 inches high. September 16, 6–12 inches high; not growing much. At this writing the plants are still green, but not growing any. The stand is good.

POTATOES.

Potatoes were grown in both raised beds and on the level ground. There was no difference in the growth or in the yields. They came up about the same time, green tops the same size, and potatoes as nearly alike in numbers and size as two peas in a pod. They were planted in ground which was seeded to oats last year. It was given a dressing of fish guano this spring at the rate of 500 pounds to the acre. The yield was about eightfold; between 60 and 70 per cent were marketable.

The potatoes were planted May 18. July 1, just coming above ground. July 15, stand good, 3–4 inches high. August 1, 8–10 inches high; beginning to bloom. August 15, tops 1 foot high, in full bloom, well set with tubers. September 2, tops 14 inches high; some still in bloom. Nipped by frost September 3, but rallied and kept growing till the 23d, when they were killed by frost. They were dug on September 26 and 27.

It is the custom of the Russians in Alaska to raise beds a foot or more high on which to plant potatoes. In the experiment here referred to part of the ground was prepared with raised beds in accordance with Russian practice, and part of it was planted in the ordinary manner in order to see if the raised beds had any merit. In this instance the result shows they had not.

VEGETABLES.

The following vegetables were planted in a cold frame April 22: Cabbage—Jersey Wakefield and Early Winnigstadt; cauliflower—Snowball, Extra Early Paris, Dwarf Erfurt; Brussels sprouts—Improved Dwarf; kohl-rabi—Large White; parsley—Extra Curled; lettuce—Thorburn Maximum Head, Early Curled Simpson, and Victoria Cabbage; broccoli— Early White.

The cabbage, Brussels sprouts, kohl-rabi, and lettuce were transplanted in the open ground June 3. A species of caterpillar was very numerous here in the spring and it ate up everything except about

twenty plants of the Jersey Wakefield cabbage. These have done fairly well, a few heads being large enough to use by September 10.

The parsley seed failed to grow.

The cauliflower and broccoli were transplanted in the open ground June 17. The cauliflower did not get very large, but began to head about the middle of August. First used for the table August 24.

The broccoli did not head. It grew leaves 2 feet high, but set no heads.

On June 1 planted the following vegetables: Peas—First and Best and American Wonder; beans—Broad Windsor, Golden Wax, Valentine Wax; spinach—Long Standing, Thick Leaved; beets—Mammoth Long Red Mangel-Wurzel and Lents Extra Early Turnip; carrots—Half-long Chantenay and Half-long Danvers; parsnips—Thorburn Hollow Crown; onions—Large Red Wethersfield and Yellow Danvers rhubarb—Linnæus; asparagus—Conover Colossal; and mustard—White London.

The caterpillars destroyed, as they came out of the ground, the carrots, parsnips, mustard, and most of the beets.

The American Wonder peas were 4 inches high and coming in bloom July 15. They had edible peas by August 10. The vines reached a height of 10–12 inches.

First and Best began blooming about the same time as the American Wonder, and had edible peas August 20. They grew nearly 4 feet tall.

The Broad Windsor beans made a vigorous growth and had numerous pods by September 1. None of them became full grown. Killed by frost September 3. The wax beans came up late in July, but were a total failure.

The spinach came up and went to seed.

The beets which were not destroyed by the caterpillars did fairly well. Some of them were 3 inches in diameter. The Mangel Wurzels, 2 inches in diameter and about 8 inches long. The onions did not do well. They were only large enough for sets. The rhubarb did remarkably well for the first season's growth and not being started in the cold frame.

The asparagus seed was a long time coming up, but the plants are about 6 inches high and thrifty.

Early Purpletop Milan turnips were sowed June 17, but the ground was so dry that they did not come up till about July 10. They made a vigorous growth and were large when pulled, October 1.

Respectfully submitted.

H. P. NIELSEN,
Superintendent, Kenai Experiment Station.

Prof. C. C. GEORGESON,
Special Agent in Charge of Alaska Investigations.

GROWTH OF FARMING AND GARDENING IN THE INTERIOR.

With a view to ascertaining what progress was being made in the interior along these lines of work, and more particularly to visit the Rampart Station and to see the condition of the work at Holy Cross Mission at Koserefsky, where the Father Superior had engaged to carry out certain experiments in grain growing, I started for the interior on July 19 by the overland route.

ITINERARY.

I obtained transportation from Sitka to Juneau on the revenue-cutter *Rush*, and arrived at the latter place July 20. From Juneau I went to Skagway on the *Al-Ki*, she being the first boat bound that way. I left Juneau on the night of July 22 and arrived at Skagway late in the afternoon of the 23d. On the 24th I took the train for White Horse. Left White Horse on the 25th and arrived at Dawson on the 27th. I was fortunate enough to get passage on a steamer bound for the lower river, and I reached Eagle July 28, Holy Cross Mission August 2, and Rampart August 13. I stopped here several hours, long enough to enable me to transact the necessary business in connection with the station. Mr. Jones, who had been in charge of this station for the past year, agreed to make the trip overland from Eagle to Valdez, and I therefore took him with me to Eagle, where we arrived August 18. I remained at Eagle until the 25th, when the *Leah* left for Dawson, which point was reached on the evening of the 28th. Dawson is the northern terminus for the boats on the lower river, and the distance from Dawson to White Horse is covered by boats of a smaller type, nearly all of which belong to the British Yukon Navigation Company. I left Dawson on the steamer *Yukoner* September 2, and arrived at White Horse September 7. There I took the train for Skagway, which was reached in the afternoon of the same day. I left Skagway again on the steamer *Cottage City* on September 9; arrived at Juneau on the 10th, and was fortunate enough to make immediate connection for Sitka by the *City of Topeka*.

I take great pleasure in acknowledging courtesies from the transportation companies in the interior. The White Pass and Yukon Railway Company gave me free transportation over their line; the British Yukon Navigation Company charged me for berths and meals only, and through W. H. Isom, esq., vice-president of the North American Transportation and Trading Company, I was tendered free transportation on all the boats with which he was connected on the Lower Yukon. This included the boats of the Northern Transportation Company, the interest of all lines having been pooled for the season.

GOOD GARDENS EVERYWHERE.

It was gratifying to behold the many and excellent gardens which were found along the river. At Eagle nearly every householder had a garden. Not only were the common vegetables quite generally grown, but flowers were also in evidence to a considerable extent. Many of the hardy annuals, such as poppies, nasturtiums, larkspur, and mignonette were in full bloom, and some of the more tender plants, as sweet peas, were in bloom at Eagle when I arrived there in the latter part of July, and there was abundant evidence that flowers as well as vegetables could be grown everywhere if they were given the requisite care. Such vegetables as potatoes, turnips, radishes, and lettuce could be seen nearly everywhere, and in several places cabbage, cauliflower, and kale were also grown successfully.

A resident of Eagle, who gave some attention to farming in 1900, promised to grow some grain the past season, but his interests elsewhere prevented him from doing so. It is, however, worthy of note that volunteer oats had come up in the little field he had in oats last year, and that it gave promise of a good crop. It would be difficult to adduce stronger evidence concerning the agricultural possibilities of that region than is furnished by this fact. Wherever grain will grow up, mature, and the waste seed live through the winter and produce a crop the following year, there certainly can not be much doubt but that farming is possible.

But it should also be noted that frosts are liable to occur at almost any time during the summer, and that in exposed places, especially on low ground along the river, these frosts may be severe enough to kill tender things. Thus a frost occurred in the neighborhood of Rampart and Fort Gibbon on July 31 of the present year, which injured many gardens in exposed positions, particularly those at Fort Gibbon, and the garden at the experiment station at Rampart was not entirely exempt. This frost, however, seems to have been confined to a limited area, for I did not note injury from it at Eagle nor on the lower Yukon in the neighborhood of Holy Cross Mission.

GARDENS AND EXPERIMENTS AT HOLY CROSS MISSION.

This mission is renowned in all the interior of Alaska, not only for its good work among the natives and the helping hand it lends to needy wayfarers, but also for its gardens. There are about 4 acres under cultivation, and the principal crop is potatoes, this vegetable forming one of the staple articles of food. Other kinds of hardy vegetables and a great variety of flowers are grown with marked success. While I was a guest at the mission, from August 2 to August 9, the table was daily supplied with new potatoes, lettuce, and radishes,

and frequently also with cabbage, cauliflower, beets, and turnips. What it is possible to do there would also be possible anywhere else on the lower Yukon. In the garden of the Sisters of St. Ann were also a great variety of flowers of the class known as hardy annuals. I found upwards of thirty varieties in bloom in the early part of August. The success of these gardens is, of course, largely due to the great care that is bestowed upon them. Thus there has been introduced a system of irrigation which is found of great service during periods of dry weather. A stream coming down from the hills has been dammed, a flume built, and sluices put in, so that it is possible to irrigate a considerable area of the cultivated ground. Hardly a weed could be found in the garden, and the tillage was well nigh perfect. One of the potato fields of the mission is reproduced in Pl. XIII, fig. 1, and shows a general view of the mission buildings. I have referred to the work at this mission in former reports. It may well be taken as a model in gardening.

In the summer of 1900 I entered into an agreement with Rev. Father R. J. Crimont, whereby he agreed to grow some wheat, barley, oats, buckwheat, and clovers during the past summer in an experimental way, and it was chiefly to note the outlook of these crops that I visited the mission. Owing to a rather injudicious selection of ground, the experiments were not a success. The ground was very wet naturally, and, therefore, cold, and could not be worked until late in the spring. Moreover, when the snow melted on the mountains in the latter part of May, it flooded this ground and made it all the worse. It was, therefore, not in good condition when the grain was seeded, on June 4. The growth was rapid in some places and slow in others, owing to the condition of the soil, and because of the wet ground the growth was prolonged more than it would have been on drier soil. When I was there in early August, the barley and oats had lodged in several places, grain was formed, but there was but little prospect of its maturing. A report on the experiment by Mr. V. O'Hare is submitted herewith:

HOLY CROSS MISSION,
Koserefsky P. O., Alaska, September 4, 1901.

DEAR SIR: I have the honor to report to you on the result of the grain-growing experiments instituted by you at this mission with R. J. Crimont.

Although the grains did not mature this summer, the result of the trial has shown that grain growing need not be entirely despaired of in this part of Alaska.

All chances seemed to combine against it this particular summer. The season was unusually short from June 4, when the seed was put in, until August 31, when a frost destroyed the potato tops. The seed was sown too thick, and during the second half of the season, just when the grain needed heat, the weather was uncompromisingly wet and cold.

In our more favorable seasons, provided the seeds were sown in good ground, the grain would probably mature. These favorable seasons occur every two or three

FIG. 1.—ALASKA STATIONS—HOLY CROSS MISSION, YUKON RIVER.

FIG. 2.—ALASKA STATIONS—NATIVE GRASS AT KOSEREFSKY, YUKON RIVER.

FIG. 1.—ALASKA STATIONS—BARLEY AT HOLY CROSS MISSION.

FIG. 2.—ALASKA STATIONS—WHEAT AT HOLY CROSS MISSION.

years, hence we may conclude that grain can be successfully cultivated every few years in this part of Alaska.

I am sending samples of the wheat, barley, and oats. The frost of August 31 entirely destroyed the buckwheat. As for the clover, it grew to a respectable height, but did not blossom.

Yours, very respectfully, V. O'HARE.

Prof. C. C. GEORGESON, *Sitka, Alaska.*

Pl. XIV, figs. 1 and 2, gives views of portions of these grain experiments. Fig. 1 shows the barley and fig. 2 the wheat.

In the neighborhood of the mission is an extensive meadow of native grass. This grass grows as high as a man's shoulder. I wanted to get a photograph of the cattle in the grass, and for this purpose asked to have them turned into the meadow, but they were entirely lost to sight when they got into the grass. Four of the five head of cattle were native born, and, of course, had lived exclusively upon native feed. They were in most excellent condition. A view of this meadow can not fail to convince the most skeptical of the fact that it is possible to grow cattle feed there in unlimited quantities. The meadow is shown in Pl. XIII, fig. 2.

WORK AT RAMPART STATION.

As stated in last year's report, a tract of land containing about 313 acres has been reserved for an agricultural experiment station opposite the town of Rampart, on the Yukon River. The tract was, and nearly all of it still is, virgin forest. The whole area is covered with spruce, interspersed with an occasional poplar and birch, and under the trees the ground is covered thickly with moss. The features which recommended this tract for an experiment station were, first, the location, and secondly, the nature of the soil, and its exposure. The greater portion of it is a gentle slope facing the south.

When I left the Yukon in August, 1900, Mr. Isaac Jones, the assistant assigned to the work in the interior, began work here, at Rampart. The means at our disposal did not admit our purchasing implements and work animals, nor could we even hire men to work. With the exception of a single laborer, who was hired for about two weeks, Mr. Jones performed the work single handed and alone with ax, mattock, and spade. He began clearing a patch of ground, grubbing out the stumps, and digging up the earth so as to get as much as possible ready for seeding, in order that we might test grain and the commoner vegetables during the present year. Mr. Jones cleared and prepared in this way about half an acre of ground. This is but a small beginning, but the best that we were able to do. The cheapest rate at which labor could be hired was $5 a day, and the lowest charge for the hire of teams was $10 a day. Could we have had a team and

two or three men, and been provided with a stump puller, and other farm implements, much more could, of course, have been accomplished. I would respectfully submit that if the work is worth doing at all it is worth the expenditure necessary to equip and maintain the station in a modest way—with a team, stump puller, plows, and other necessary farm implements. To do this, however, will cost about five times more than it would cost to equip a similar station anywhere in the States. I had Mr. Jones look up a team of horses with a view to buying them if they could be purchased within our available means. He found a team of average weight and in fair condition, which the owner was anxious to sell, but he could not afford to sell them for less than $800, and considering the expense of importing them, they were worth that; but we were unable to buy. For the same reason no house or cabin was built at this station the past year. Mr. Jones could not handle the logs alone and I was unable to authorize him to hire labor to help. He was fortunate enough, however, to get the use of a wood chopper's cabin, which had been built on the bank of the river a year or two before. It was poorly built and in a dilapidated condition, with the roof leaking so badly that until repaired Mr. Jones found it necessary to put a tent up inside in order to keep dry at night. It had a single small window, and a floor made of poles after the fashion of a corduroy road. Such were the quarters we were obliged to occupy the past year. A photograph is produced herewith (Pl. XII, fig. 2).

EXPERIMENTS WITH GRAIN.

Mr. Jones found a clump of volunteer rye in the lot back of the North American Transportation and Trading Company's store. How it got there nobody knew, but in all probability it was a handful which had been scattered from a sack of feed. It was a fall variety which had stood the winter and had come out in the spring in a sufficiently healthy condition to mature seed. This fact was proof of its hardiness. He gathered the grain and seeded it in raw, rough ground on August 15. A few spears had pushed through the soil on the 28th, and the growth from that date until the patch was covered with snow proceeded slowly. Apparently every seed germinated, and the rye went into winter quarters in good condition. It began snowing early in October, before there had been any severe frost, and the amount of snow gradually increased with the cold. By the 1st of November the snow was about 15 inches deep, and later in the winter it was increased to 3 feet. This appeared to be a sufficient covering to protect the grain from the severe frost for, although the thermometer is said to have registered more than 70° below zero, the rye was not injured in the least. It came out in excellent condition in the spring. The snow was not a sufficient covering, however, to keep the ground from freez-

ing. Owing to the removal of the moss which enabled the sun to reach the surface of the earth, and doubtless aided also by the tearing up of the roots, the soil had thawed out to a depth of 18 inches by the time the rye was seeded; but in spite of the snow covering, the ground nevertheless froze again during the winter clear down to the old ice.

On May 13, 1901, the snow melted from the plats, and the rye appeared green and in perfect condition. The plants tillered abundantly, sending out from 10 to 18 shoots each. It grew very rapidly. On June 23 it was 2 feet high, with heads showing here and there. On July 20 average stalks measured 5 feet 4 inches high. At that date the heads were filling rapidly. On the night of July 31, there was a light frost, sufficient, however, to kill potato tops and other tender vegetation. But the rye and in fact nearly all of the grains were not injured. The grain was then in the dough state and almost ready to cut. Most of it was cut on August 3. When I was at the station August 13, some of it which had not been cut was perfectly ripe, and it had a good quality of grain.

This then proves that winter rye can be grown in that latitude. Rye is the principal breadstuff in all northern latitudes. Northern people prefer it to wheat, and it is probable that the future farmers of Alaska will likewise make rye a principal crop.

It should be noted also that the past winter registered the coldest weather in the interior that the proverbial "oldest inhabitant" has ever known. The test is, therefore, as severe as it is likely to be at any future time.

SPRING GRAIN.

Patches of several varieties of spring grain were sown in the latter part of May. But I have at this writing received no word from the Yukon since I left the station on August 13 as to whether they matured or not. At that date the barley and the rye were the only grains which had matured. Several other kinds had fully formed grains, and would soon begin to ripen, but having no information concerning their later development I can note only their growth and condition up to the date of my visit. The spring grains seeded were as follows:

Spring rye.—A plat was seeded May 21. By July 7 the plants had reached a height of 18 inches and were showing heads. On July 31 the stalks were 5 feet high and the grain two-thirds formed. On August 13 the grain was fully formed, but still green, and in the soft dough.

On June 5 another plat of spring rye was seeded. The growth was rapid but the stand thin, and the plants did not tiller. July 10 the stalks averaged 20 inches and the heads were showing. July 31 the stalks were 4 feet 7 inches high and the grain forming. August 13 the grain was rather more than half grown.

BARLEY.

Manshury.—A plat of this barley was sown May 23. It was somewhat slow in starting, but when it came up the stand was good and the plants healthy in appearance. On July 12 it was 16 inches high and beginning to head. On July 31 it was 2½ feet high and the grain nearly grown. It was not injured in the least by the frost that occurred on the night of that date. August 13, when I was at the station, it was ripe and ready to cut at any time. The grain was plump, the heads heavy, and quite yellow in appearance. The accompanying illustration (Pl. XV, fig. 1) is a reproduction of a photograph of this patch of barley. It is another proof in addition to the many already on record that barley can be grown very successfully in the interior. The only point to note being that early maturing varieties should be selected.

On June 5 another plat of the same barley was seeded. July 18 it was 18 inches high. July 31 it was 2½ feet high and the grain about half grown. It was not injured by the frost. August 13 the grain was fully formed, but it had not begun to ripen.

OATS.

Burt Extra Early.—A plat of this variety was seeded June 4. It started to grow promptly. The plants were healthy and made an even stand. July 18 it was 15 inches high and had begun to head. July 31 it was 2½ feet high and the grain half formed. It was not injured by the frost which occurred on the night of that date. August 13 the grain was fully formed, but still in the milk, and showed no signs of ripening. This variety has, all things considered, given the best satisfaction of the many kinds tried at the Sitka and Kenai stations. It is not a heavy yielder. The straw is short and the grain small, but on the coast it has matured in time to be harvested before the fall rains set in, as a general thing, and in the interior it will probably prove to mature before killing frosts occur in late summer.

Perm.—A variety of Russian oats imported by the United States Department of Agriculture. The seed used was grown at the Sitka Station. It was planted May 23. It grew promptly and made a good stand. July 14 the plants averaged 16 inches high. July 31 the crop was 32 inches high, the grain almost fully formed, and heads of fair size. It was not injured by the frost of July 31. August 13 most of the grain was still in the milk and had not begun to ripen. It was 4 feet high. I have not heard if it matured.

Another plat of the same variety was seeded June 6, also from Sitka seed. July 19 it was 18 inches high and heading out. July 31 it was 27 inches high and the grain rapidly developing. It was not injured by the frost. August 13 it was in the milk.

Flying Scotchman.—Small plats were seeded of this and also of the

FIG. 1.—ALASKA STATIONS—RIPE BARLEY, RAMPART, AUGUST 13, 1901.

FIG. 2.—ALASKA STATIONS—GRASS, RAMPART CREEK.

following variety, but both were too late to mature the past season. It was seeded June 4. July 31 the tallest stalks were 26 inches high, only about half headed, and beginning to bloom. It did not appear to be injured by the frost of that date, but it is doubtful if it matured seed.

Common oats (such as is offered for sale for feed).—A plat was seeded June 4. By July 31 it was about 2 feet high and heading out. It was slightly injured by the frost of that date.

Russian White.—This variety was also grown from seed produced at the Sitka Station. The plat was seeded June 4. July 24 it was 16 inches high and beginning to head. Rather uneven in growth. July 31 the best was 2 feet high and in bloom. August 13 the grain was half grown. This variety is not an early one, and probably not as well suited to this region as some of the others named.

SPRING WHEAT.

Ladoga.—Plat seeded May 29. It appeared slow to start and the plants were not vigorous. July 24 it was 15 inches high and beginning to head. Foliage was rather light in color. July 31 it was in bloom. The heads with the blossoms exposed were injured by the frost of that date. August 13 the heads which were not injured were beginning to fill.

Romanow.—Seeded May 23. July 19 it was 22 inches high and beginning to head. July 31 it was 3 feet high, and some heads had passed the blooming stage; others were still in bloom. Those in blossom were injured by the frost. August 13 the earliest heads had grain three-quarters grown, and it may have matured. The Romanow has been our most successful variety at the Sitka and Kenai stations.

Roumanian.—A plat was seeded May 29. It started slowly, but the young plants were stocky and healthy. July 21 it was 23 inches high and beginning to head. July 31 it was 3 feet high and for the most part past bloom. It was a vigorous grower, and was not injured by the frost. August 13 the grain was fully three-fourths grown. It may have matured.

Another plat of the same variety was seeded June 6. July 21 it was noticed that the earlier seeding was slightly more vigorous. August 13 most of the heads had grain half grown, but it had not caught up with the earlier planting.

The central facts in these grain experiments as far as they are known to the writer at this date, are: First, that fall seeded rye lived through the winter, came out in the spring healthy and vigorous, and produced plump and perfectly matured grain by the beginning of August. Secondly, that barley seeded in the latter part of May matured seed by the middle of August. In last year's report several instances were reported of grain maturing at various points on the Yukon.

CLOVER.

May 23, two plats were seeded to clover, one alsike and the other red clover. The seeds started slowly in both cases, but eventually made a good stand. August 13 both beds were about 9 inches high. The alsike seemed to be slightly the more vigorous. Some red clover was also scattered on ground that had been burned over, but neither cleared of brush nor dug up.

VEGETABLES.

Mr. Jones makes the following report on the growth of vegetables:

A cold frame was sown to lettuce, cabbage and turnips on August 15, 1900, in order to see what they might do. The soil was new and raw and the plants made only a poor growth, and on the whole went into winter quarters in poor condition. When the frame was uncovered May 13, 1901, nearly all of the plants had been eaten by field mice, but a few plants of cabbage and lettuce were still growing. The muslin covering and the snow had been sufficient to protect them against winterkilling. Some turnips sown outside the frame in the fall, and which had no artificial covering but the snow, came through the winter alive, but soon after growth started in the spring they were eaten by insects.

In the spring of 1901 a plat of sandy loam was selected close to the river which was planted to vegetable seed as soon as the soil could be worked. The selection of the ground proved unfortunate, as the unusual rise of the river washed away a portion of the garden, and for nearly a month the surface of the water was almost on a level with the portion which was not washed away. All growth ceased and, with the exception of radishes and lettuce, vegetables on this piece of ground were an entire failure. Later, vegetable seeds were planted in soil well back from the river. Here the flea-beetle appeared in large numbers, and radishes, turnips, and the first planting of cabbage plants suffered greatly from them. Rabbits also visited this patch, and beets, peas, and cabbage suffered in consequence. Such plants as escaped these pests grew rapidly—lettuce, kale, peas, onions, and carrots being worthy of special mention. The soil was worked down to a fit condition for vegetable seeds with much labor, and the result on this land was more favorable than was hoped for at the time of planting.

A large number of persons received seed from the station this year, and many of them report much success with their gardens.

There are a number of good gardens in Rampart this year, Capt. A. D. Williams having one of the best. Captain Williams has been a successful gardener in Alaska for some years, and the present season he has over an eighth of an acre in cultivation. Capt. Alfred Mayo is one of the oldest gardeners in this section of the country and has been very successful in this line.

BUCKWHEAT.

On June 6 two small plats, were sown with buckwheat. Plat No. 1 to seed from Maine, and No. 2 to a Russian variety. The Maine seeds sprouted quickly and produced a good stand of thrifty plants, which had reached a height of 16 inches and was beginning to bloom on July 20. July 26 an average stalk was 22 inches high. Plants were killed to the ground by the frost of July 31. The Russian variety did not start readily and the stand was poor, but the stalks were vigorous and made a rapid growth. July 17 a few stalks were in bloom, and average stalks were 20 inches in height. July 26 average stalks were 28 inches high, with the grain forming. Killed to the ground by the frost July 31.

POTATOES.

A small quantity of seed potatoes grown at Rampart, last year, was obtained, placed in a shallow box, partly covered with sand, and exposed to the light May 1. At the same time a few pounds of outside potatoes were obtained and these were treated in like manner. Both lots were planted May 23. The soil was rather wet and stiff for planting at this time, and the weather continued cold and damp for some time afterwards. The first potato leaf showed through the soil June 16. From that time on growth was rapid. July 15, stalks from native seed showed blossoms, while the other variety bloomed June 24. Frost of July 31 killed the stalks to the ground. Native seed had at this date produced potatoes as large as an egg, while outside seed produced only very small potatoes.

SETTLEMENTS ALONG THE YUKON.

It may be interesting to name the leading settlements along the river and the approximate distances between them, in order to give some idea of the extent of the territory. The distances here given are only approximate and may vary somewhat in either direction.

Eagle City, which is the first town in American territory, is 106 miles from Dawson. It is beautifully located on high ground in a bend of the river near Eagle Mountain, which is an imposing mass of granite rising to a height of about 2,000 feet. This town will undoubtedly be an important one, especially if the projected railroad through the interior should terminate here. It lies on the margin of a large tract of land sufficiently level to be brought under culture. There is a permanent population of some hundreds of people, and Fort Egbert, which is garrisoned with about two hundred soldiers, is located here.

From Eagle to Circle City is a distance of about 175 miles. This town is located in the border of the "Flats," and the region of the immediate neighborhood is treeless. It is likewise a town which is destined to be permanent. It has come into prominence because it is

the nearest point on the river from which the gold fields on the tributaries of the Tanana can be reached. The absence of timber gives the place a somewhat desolate appearance, but it is a thrifty, enterprising town and is constantly growing in population. Probably a large percentage of the vast expanse of level country in that neighborhood can be used for agricultural purposes.

Fort Yukon is located a few miles inside the Arctic Circle, at the mouth of the Porcupine. It is about 85 miles northwest of Circle City. This is an old settlement, having been a trading post of the Hudson Bay Company many years ago, but it has never become an important post. The permanent white population probably does not exceed one dozen persons, and the Indians in the place are not numerous. A reservation for an experiment station was made there in 1900, but the available funds have been too limited to do any work there.

Rampart is a thriving town, some 200 miles below Fort Yukon. There are several hundred log cabins in this place and a few quite good houses. It takes its importance from the proximity of the placer mines on Minook Creek and its tributaries. The country in the immediate vicinity is rolling, but there is considerable agricultural land in the valleys. The vegetation is luxuriant wherever the ground has been cleared. Pl. XV, fig. 2, gives an illustration of the height of the grass in the valley of Minook Creek. The photograph from which this reproduction was made was taken by Mr. Erastus Brainerd.

Tanana, the next settlement of importance, is located about 80 miles below Rampart; it is at the mouth of Tanana River. The post-office is named Tanana. The settlement was originally called Weare, and the trading post of the North American Transportation and Trading Company still bears this name. Fort Gibbon is located here. It was built in 1900 and has a garrison of approximately two hundred men.

The next settlement of importance is Nulato, located about 225 miles below Tanana. Nulato is an Indian settlement of considerable size. There are also a couple of stores and a Roman Catholic mission. The surrounding country is sufficiently level for cultivation. Pl. XVI, fig. 1, is of interest because it illustrates the leading industry of the Indians during the summer months, namely, the catching and drying of fish. Large quantities of salmon are annually caught at various points on the Yukon; the fish are cleaned, cut in halves, and dried on poles, as shown in the illustration.

Anvik is the next important settlement. It is about 190 miles below Nulato. The population is chiefly Indians, but there are also a number of white people and an Episcopal mission. A portion of the town is illustrated in Pl. XVI, fig. 2. From Anvik to Holy Cross is a distance of about 30 miles. This settlement has already been referred to in detail. Some 80 miles below Holy Cross is a little settlement

FIG. 1.—ALASKA STATIONS—FISH DRYING AT NULATO, YUKON RIVER.

FIG. 2.—ALASKA STATIONS—ANVIK, YUKON RIVER.

known as Russian Mission, missionaries of the Russian Church being established here. And still nearer the mouth of the river, in the treeless region, is the settlement of Andreaoffski, a place which is chiefly of importance because it affords winter quarters for the river boats, and the storehouses belonging to the commercial companies are located here. The whole distance from Dawson to St. Michael is nearly 1,500 miles. Besides the places named, there are many small Indian villages, and during the summer many temporary fishing camps are established along the river.

The transportation on the river is carried on by means of a number of steamers, some of which are large and powerful boats with first-class accommodations for passengers in every respect. These boats consume an immense amount of fuel, as it takes great power to propel them against the current. They have sometimes two or three barges in tow. Wood is the principal fuel used, though coal is used to some extent and its use will probably increase with the development of the coal mines along the river. The boat is tied to the bank, a gang-plank thrown ashore, and a number of men carry the wood aboard on their shoulders. There is considerable coal mined on the lower Yukon, which is used for supplying steamers (Pl. XIX, fig. 2).

A telegraph line has been built by the War Department from St. Michael to Fort Gibbon.

FARMING AT DAWSON.

At Dawson I found several persons engaged in raising produce for the city market. The most extensive farmers at that place are two brothers named Morgan. They are American citizens who have tried their luck at prospecting; but although they were fairly successful they prefer farming. Mr. J. A. Morgan, one of these brothers, informed me that he had rented 110 acres of land from the Canadian Government on the west side of the river just across from the city for a rental of 50 cents an acre a year. He has a lease for ten years, with the privilege of buying at the end of that time. The price of land was not to be fixed, however, until the expiration of the lease. He grows vegetables on a rather extensive scale, confining himself to the standard crops, such as potatoes, cabbages, cauliflowers, turnips, radishes, and lettuce. He also grows grain for hay. This year he had 40 acres in oats. These oats were seeded on May 20 and cut for hay early in August, at which time they were almost ripe. It is more profitable to cut the grain for hay than to let it mature. The past season grain and hay sold exactly at the same price per pound, namely, 6½ cents, or $130 a ton. This was Mr. Morgan's first year and, therefore, he did not have all the land in condition for cropping. He was clearing and preparing the rest of the farm for crops the coming sea-

son. His brother had an equal area of land on the same terms, and he planned to follow the same line of work.

Pl. XVII, fig. 1, is a view of Mr. Morgan's house. The fenced portion of the front yard was well stocked with flowers, which were tenderly cared for by Mrs. Morgan, but they do not show up well in the illustration. Pl. XVII, fig. 2, is a view on Mr. Morgan's farm, looking east. The city of Dawson is in the background to the right on the other side of the river. There were numerous vegetable gardens in various places about Dawson, but more particularly on the west side of the river, and all of these did a thrifty business.

Pl. XVIII shows a display of native grown vegetables in the butcher shop belonging to Mr. J. G. Boyd. The list comprises the following: Cabbage, rhubarb, kale, native cranberries, cucumbers, lettuce, peas, radishes, turnips, cauliflower, carrots, and new potatoes, all grown at Dawson, and for sale there in the latter half of August. This illustration simply adds one more item to the already voluminous testimony which we have in regard to the possibilities of the interior of Alaska.

I met the owner of a hay farm which I was told had proved quite profitable. The owner was Mr. Samuel Henry, and his farm is located in the valley of the Stewart River, 25 miles from its mouth. He has 80 acres under cultivation, and he devotes nearly the whole area to hay, which, at the price named above, it can readily be seen is a profitable business.

WHAT OTHERS SEE IN THE YUKON VALLEY.

I submit herewith an article on the agricultural possibilities of the Yukon Valley by Mr. Erastus Brainerd. It is of interest because it expresses the views of a private citizen who has spent years in the country, who by both education and training has been accustomed to look for facts, and who records the facts as he sees them without bias or prejudice on one side or the other. In the course of looking after his interests in the interior, Mr. Brainerd has had occasion to make extensive trips through the country in many directions; he has noted the characteristics of climate, soil, and vegetation peculiar to the various regions he has traversed; he has obtained information from hundreds of prospectors whom he has met; he has studied the results arrived at by other investigators, and he has noted the facts as regards the agricultural possibilities of other countries in the same latitudes and with similar climatic conditions. From this accumulation of data, he comes to the conclusion that agriculture in Alaska is destined to play an important rôle in the development of the resources of the Territory, and that as a matter of course it will also be an important factor in the growth of population and its future history. Of the thousands who visit Alaska there are comparatively few who are as

FIG. 1.—ALASKA STATIONS—FARMHOUSE, WEST DAWSON, YUKON RIVER.

FIG. 2.—ALASKA STATIONS—ON MR. MORGAN'S FARM, WEST DAWSON, YUKON TERRITORY.

ALASKA STATIONS—KLONDIKE-GROWN VEGETABLES DISPLAYED IN DENVER MARKET, DAWSON, YUKON TERRITORY.

FIG 1.—ALASKA STATIONS—VALDEZ, AS SEEN FROM THE BAY, GLACIER IN THE CENTER.

FIG. 2.—ALASKA STATIONS—COAL MINE ON THE LOWER YUKON.

competent to note facts and to interpret them as Mr. Brainerd has done. Most people who go there have preconceived ideas of the country and its possibilities. These ideas have as a general rule been based on the well-nigh universal opinion that Alaska is a barren, useless waste, and they are unable to correct and readjust these ideas so as to conform to the actual facts. Mr. Brainerd's article appeared in the Seattle Post-Intelligencer of September 29, 1901, and is as follows:

YUKON VALLEY FARMS.

Omne ignotum pro terribile—the unknown is a terror—was a common saying with the Romans before the Christian era. So when I went up the Yukon four summers ago and wrote to the Post-Intelligencer that what impressed me most was the luxuriant vegetation, the size of the timber, and the apparent agricultural possibilities, I was not only laughed at by the incredulous, but was asked seriously, "How can anything grow in that terrible frozen region?" Three short years have broadened the knowledge of many, but still the doubters are more numerous than the believers. I hope to show to their satisfaction that the "agricultural possibilities of the Yukon" are neither so visionary as the mirages nor so uncertain as the movement of the auroras which are common in that country, and to-day I present the first photographs that have been made public of actually growing cereals.

Let me first call attention to the fact that it is within the memory of men when the rich and fertile States of Nebraska, Kansas, and Colorado were marked on the maps as the Great American desert. If the great American desert now blooms with valuable wheat, if not with the beautiful rose, the watersheds of the Yukon may yet be known as the seat of a thriving agricultural community. Of course, the public is becoming familiar with the argument from analogy in the case of Finland, which lies largely in the same latitude as Alaska. It is well known that that country, with only 50,000 square miles of agricultural land, sustains over 2,500,000 people; that at their last report they raised 28,000,000 bushels of cereals, 4,000,000 pounds of flax and hemp, had nearly 3,500,000 cattle and sheep, and exported butter, cheese, oats, and live stock. If a stronger argument from analogy be sought it may be found in the report for 1897 of Alexander Platonovich Engelhardt, governor of the the Russian province of Archangel, which borders on the Arctic, extends to 71° north latitude, and has by far the greater part of its area north of the sixty-sixth parallel.

A MATTER OF ISOTHERMS.

Archangel, its chief town, has nearly 20,000 population, and is in the latitude of the settlement of Nulato on the Yukon. In 1897 the population of the province was 350,000 persons, who in that hyperboreal region raised 60,000 tons of wheat, rye, oats, and potatoes, owned 260,000 cattle and sheep and 280,000 domestic reindeer, and exported over $1,000,000 worth of wood, cereals, butter, and flax. In all the province, Governor Engelhardt says, there are only 216,000 acres of agricultural land and 516,000 acres of pasture land.

But the argument from analogy is often fallacious. If a man were to speak of olives and oranges grown in the latitude of Denver, Indianapolis, or Philadelphia, he would be jeered at by the unthinking, yet that is precisely what is done in California in the latitude of these cities, while apricots and prunes are grown in the State of Washington north of the latitude of Nova Scotia and New Brunswick.

Agriculture is a matter of isotherms and not of latitude, and the isothermal lines in the Yukon Valley, so far as is known, are more favorable to agriculture than those of Finland, for while the winters are colder the summers are hotter. Coming to the

actual climate and soil of the Yukon watershed, let us see what they are, what they are doing for agriculture and can do. The records are incomplete, but they show a high range of temperature which will surprise the uninformed. At Fort Yukon, which is just inside the Arctic Circle, Dr. W. H. Dall, now in the Government service, reported in 1868 that the temperature in July "not in the direct rays of the sun" was 112° F. In June, 1900, the record for the month showed a maximum of 93°, and in July 87°. At Eagle, near the Canadian border, May to August, inclusive, showed a daily average maximum of 79°. Holy Cross Mission, which is less than 350 miles from St. Michael, showed an average maximum for May to September, 1899, of 69°, with a maximum of 82°. The 6-inch soil thermometer at Fort Yukon gave a daily average for June, 1899, of 50.8°, and July gave 54.9°. At Eagle, August gave a daily average of 53° for the 6-inch soil thermometer. The minimum surface temperature during June, July, and August was 25 in August at Eagle, 27 in June at Fort Yukon, and 24 in June at Holy Cross. These minimum temperatures may seem adverse to agricultural success, but the cold was of exceeding brief duration, the soil was warm, and the sun shone almost throughout the twenty-four hours, and the frost though sharp was not killing. Further, it is to be remembered that the points named are most exposed, that Eagle is in the foothills, Fort Yukon within the Arctic Circle, and Holy Cross is subject to the cooling influence of Bering Sea. In other words, the places named are not selected and not the best suited for agriculture.

FIRST EXPERIMENTS MADE.

Naturally the first experiments have been made along "the main traveled road," the great waterway, and while even there the experiments are pregnant with promise, it is in the smaller valleys of the larger affluents of the Yukon that, I believe, the richest future lies. On the verge of the Yukon itself the winds blow up or down according to the season, but in the smaller valleys the wind is still or milder, and the vegetation more luxuriant. This is true of the streams to the north, but much more so of those to the south. Professor Georgeson tells of a great natural meadow some 20 miles long by 4 or 5 wide within the Arctic Circle east of the Koyukuk, and I have been told by reliable persons of a similar meadow on the Dall River. South of the Yukon lies the great valley of the Tanana, which is nearly as long as and has a valley that is wider in places than the Connecticut, the Hudson, or the Sacramento. It rises in the Alaskan coast range and enters the Yukon at Fort Gibbon, 80 miles west of Rampart, and nearly midway between St. Michael and Dawson. In the last half of May, 1899, I made an expedition up the Minook from Rampart and over the divide into the Tanana watershed. The ice still closed the greater part of Minook, and snow was on the ground and the air chill. On crossing the divide the scene shifted. The air was as mild as possible; the redtop grass was as high as my shoulder; lupines and vetches were in bloom, and berries and flowers of many kinds. The creeks were all open, and the season seemed two months ahead of the Yukon. In 1900 the Yukon broke up at Rampart in the third week of May, while the Tanana broke the second week in April. During winter rain never falls in the Yukon. On the Tanana it rained, to my knowledge, in December, 1899, and in January, 1901. It is in this valley that I believe agriculture and stock raising will be found most practicable. Speaking of stock raising, Captain Abercrombie, of the Army, lost a horse in the Tanana Valley in the fall of 1898 and found it well and hearty in the spring of 1899, and a miner named Green, who worked for me last winter, had the same experience in the winter of 1900. At Holy Cross they have a herd of five cattle, four of which are native born, and all are well nourished on native grasses, while horses have wintered and worked all winter on mixed feed and native hay during the past four years at Eagle, Circle, Rampart, and Fort Gibbon. I owned a cayuse which was worked hard all winter, had no covering for protection in the coldest of weather, and is fat and hearty to-day, although the thermometers all failed to

register the extreme cold of last winter, which was estimated at 70° to 80° below zero.

The summer months are rainless, or nearly so, but the soil is moist and cool, while the nights are bright and warm, a condition that is most favorable to steady plant growth. I see no good reasons why carefully selected seeds should not be found that will be adapted to the climatic conditions. In fact, so far as known the climate does not affect the seeds adversely and the winter does not kill them. While the temperatures that I have noted above are average, it must be remembered that the heat during the day in the direct rays of the sun is intense. On July 4, 1900, I noted the thermometer at the Alaska Commercial Company's store at Rampart to be 110°, while this year at Nulato on July 24, at midday on the river, it was 117°, and I have noted above that Dr. Dall found it at 112° at Fort Yukon. With temperatures like these it is reasonable to assume that the climatic conditions of a great part of the Yukon watershed will surely be found favorable to the growth of rapidly maturing, hardy cereals.

That the soil of the Yukon in itself should be capable of producing almost any useful article of vegetable food should be obvious to even a careless observer. Few seem to remember that the great river heads in the Rocky Mountain range; that the Pelly, the MacMillan, the Stewart, and the Porcupine are to the west side of the range what the Milk, the Yellowstone, or the Missouri are to the east side; that the same influences which have carried vast volumes of silt to form the richest alluvial valleys in the United States have operated similarly on both sides, and that the rocks whose decomposition have led to forming the alluvium are the same in the case of the Yukon as in that of the Mississippi; that the volume of the Yukon is greater than that of the "Father of Waters," and that the deposit of the sediment is made in the same way. There can be and is no real question as to the richness of the soil of the Yukon Valley. The only question of importance is, "What can it be made to grow?"

FACTS, NOT FANCIES.

The proof of the pudding is in the eating, and I propose to recite briefly what has been done, basing my statements on those of Professor Georgeson, special agent of the United States Department of Agriculture, and on my own observation, which both complements and supplements that of Professor Georgeson, as I have been over the same ground on the Yukon that he has been, and more. The statements are supported by photographs, which are the first yet taken and made public of the work of the United States agricultural experiment station at Rampart, and of the work of the Jesuit Fathers at their Holy Cross Mission at Koserefsky, on the Yukon. The photographs were taken at Rampart on July 13 and at Holy Cross on July 28, 1901.

Dawson, the best known point on the Yukon, the capital of the well-known Klondike region, is, of course, in Canada. It is well up in the foothills, and has an elevation, I believe, of 2,000 feet above sea level, yet I have seen in Dawson, at their chamber of commerce, fine samples of ripe barley and oats, which Professor Georgeson also saw, and I was told that wheat had been ripened on the Klondike River itself. At Fortymile, near the border, I was told by so many different persons, some of whom I know to be credible witnesses, that I believed them, that an old settler named Patch, so long ago as 1891, raised potatoes for sale, and also had matured samples of wheat and oats. At Eagle this summer, in June, I saw barley and oats growing. Professor Georgeson saw them headed out on July 6, 1900, and later received ripe seed and a head of ripe wheat as well. At Eagle, as at nearly every other point on the river, the Jesuits have fine root crops, growing potatoes, turnips, cabbages, and cauliflower, beside what the Yankees used to call "garden sass," lettuce, radishes, cress, and the like. Circle City was founded ten years ago, and while the country round about is wet, oats have ripened there for at least three years. At

Rampart, in 1895 and 1896, a Norse miner named Peterson, who died last winter, raised cabbage and potatoes successfully on what is now a mining claim on Little Minook Creek, a tributary of the Big Minook, which enters the Yukon at this point. In the summer of 1900 there were several successful gardens at Rampart. Last year Professor Georgeson established an experiment station with Mr. Isaac Jones, a graduate of the Kansas Agricultural College. Single handed, and with mattock and spade alone, Mr. Jones cleared the ground, stripping the moss and grubbing roots from about a half an acre, which was planted with wheat, rye, oats, barley, buckwheat, turnips, and potatoes.

RABBITS DAMAGE CROPS.

Rabbits caused some damage to his crops, but the way they looked on July 13 of this year may be seen in the photographs better than from description. It should be said that the most successful growth was of rye, which was seeded from a few heads of ripe volunteer grain found by Mr. Jones on August 15 of last year, growing in the rear of the North American Transportation and Trading Company's store at Rampart, where the seed had evidently been dropped the season previous from a sack of feed. All this grain was sown in the fall, and as last winter was the severest known on the Yukon, it is evident that seed at least will survive the hardships of a Yukon winter. Mr. Jones's poorest crop was Siberian buckwheat, sown from seed supplied by the United States Department of Agriculture. Some buckwheat of unknown origin did much better, and both were in flower when I took the photographs. The rye, barley, and oats made a fine stand, but wheat was not well on. The soil at this point was a clay loam, with some sand, located about a furlong from the present river bank. The grain was far enough along to indicate that it would be ripe before the hard frosts would naturally set in. At Fort Gibbon, at the mouth of the Tanana, on the north fork of the Yukon, Mr. Georgeson saw and picked oats that were ripe on August 4, 1900. They were part of a patch of volunteers, most of which had been eaten down by the cattle of the fort, but had headed out in second growth and were in bloom. At Holy Cross Mission the Jesuit Fathers, under Father Raphael J. Crimont, a learned, accurate, painstaking, and systematic worker, have made greater progress in farming than at any other point. They have a herd of cattle, all but one native born, fed wholly on native grasses. There are over 3 acres in garden and grain this year. On this they have raised over 500 bushels of Early Rose potatoes on less than two acres. Most of the potatoes are small and not mealy, but they are good, and the largest weighed 17 ounces. They have raised turnips weighing 8½ pounds, and beets and carrots weighing over ¾ of a pound each. This year, for the first time, they planted grain which was supplied by Professor Georgeson, and I give photographs showing how it looked on July 28. The soil at this point is not very good, and it was prepared without suitable implements.

MOST CROPS FLOURISH.

It is true that "one swallow maketh not a summer," and there is no reason to think that the farms of the Yukon will ever rival the bonanza wheat fields of Dakota; but it is equally true that wheat, oats, rye, and barley have ripened and produced mature seed at different points during several years under the most adverse circumstances on the Yukon. It is also true beyond peradventure that most crops and nearly all garden vegetables grow to perfection wherever the ground is scratched, and that currants, raspberries, gooseberries, cranberries, huckleberries, and many other native small fruits do exceptionally well. It seems reasonable to conclude, therefore, that time and attention will show that ordinary agricultural operations can be carried on successfully, more so than anyone would have believed four years ago, and more than the great American public yet realizes. It will amaze most people

even now to learn that the careful estimate of Professor Georgeson, the Agricultural Department's expert, who has personally been over the ground, is that Alaska contains 100,000 square miles of tillable and pasture land and that "it is chiefly the vast region in the interior" which will furnish the agricultural land. In this estimate I believe he is correct. I have spent much more time than he has in the country, have traveled the river from source to mouth, and have made it a point to question the majority of the miners and explorers whom I have met, certainly at least a thousand and probably more during four years, men who have been on nearly every creek and river of the Yukon watershed, the Porcupine, Koyukuk, Tanana, White, Shageluk, Melozi, Novi, Dall, Chandeleure, Chena, Nenana, Ozanna, and others, some not yet mapped, and while neither their testimony nor mine is expert, and while some were skeptical, by far the greater number believe that some day the Yukon valleys will be settled by small farmers, particularly by the sturdy Norsemen, men who as Professor Georgeson suggests, "possess the courage to face and sufficient energy and strength to endure the hardships incident to pioneer life in a northern climate, who can clear and till the land with their own hands." Such men, who do not look for a market, but for a home where they can support themselves in independence, will eventually find it in the Yukon Valley, where by a little farming, some fishing and hunting, and some mining they may be happier and more comfortable than they are now. In fact, there are a very few such persons there now. I know personally an Englishman and his wife who have located a farm on which they are already self-supporting and where they expect to end their days.

I have mentioned fishing as incidental to farming, for the wealth of fish in the streams is almost incredible even to a resident of Puget Sound, where the salmon canning industry is so vast. As an indication of what it is I give a photograph of salmon drying at one Indian village, Nulato, where the fish are caught by the most primitive methods. I have mentioned none of the drawbacks, for they are only those incidental to pioneering. Isolation, cold, and insect pests, mosquitoes, and gnats. These are bad, but I believe they are no worse than the Pilgrim Fathers found when they first landed on the "stern and rock-bound coasts" of New England. There the cold was more intense because it was damp, the mosquito plague at first as bad, and the isolation greater, because the Pilgrims were months from civilization where the Yukon pioneers will be weeks, while with the Government telegraph line now building completed they will not be days from touch with the rest of the world.

EDITORIAL COMMENTS.

The same issue of the Post-Intelligencer which contained the foregoing article by Mr. Brainerd, namely, that of September 29, 1901, contained also an editorial on the general subject of agriculture in Alaska, which I submit because it shows that the leavening forces of investigation and education are at work and because it aims at the correction of misleading conclusions, drawn from faulty premises, but which have been widely disseminated throughout the country. The fact that but few men make their living in Alaska by agriculture at present should not be taken as proof that the country has no agricultural possibilities. The editorial is as follows:

The publication of a little bulletin by the Census Bureau, dealing with agriculture in Alaska, has led to an amazing amount of uninformed comment by newspapers of the country. One would have supposed that even the most careless newspaper writer would know that census investigations deal with facts as they are and not with facts that may or may not exist hereafter. One would not expect the statistics

of an undeveloped industry in an undeveloped country to be taken up and commented upon as a measure of that country's capabilities and a statement of its limitations in that especial direction. Yet that is just what has happened.

The same dogmatism of ignorance that once condemned the central spaces of this continent, now the home of millions of thriving people, to desolation, tells us that farming can not be carried on in Alaska.

We have taken occasion several times to correct the ludicrous but injurious conception of Alaska's future thus set before the people by agencies to which they are accustomed to trust for facts. We have, in particular, pointed out the conditions of climate along the already well-known coast region of Alaska, the modifications produced by the warm Japan current, and the certainty of profitable returns on agricultural industry there wherever there are reaches of lowlands suitable for cultivation. But it will be novel to most of our own readers to hear that the agricultural possibilities of interior Alaska, especially of the valley of the Yukon and its tributaries, are even greater than those of other sections. For here we have the splendid alluvial soil that characterizes the river bottoms of our own mountain regions, while the climate is such that almost all the products of the north temperate zone may be raised there with certainty and in abundance.

This fact is set forth in an extremely interesting and valuable article by Mr. Erastus Brainerd, which appears elsewhere in this issue. Mr. Brainerd is not talking theory, but fact. He is a man who sees things as they are and understands what he sees. He writes of a country with which he is personally familiar. He tells what has actually been done as well as what is possible. And his statements are reenforced by a series of photographs, taken on the spot, which may convey a few new conceptions to those in the East who have formed their ideas of Alaska from a view of the Muir glacier.

Mr. Brainerd says: "Wheat, oats, rye, and barley have ripened and produced mature seed at different points during several years under the most adverse circumstances on the Yukon." He says that most crops, and nearly all the vegetables, with small fruits, grow in the greatest profusion with but little care, while there is no question of the value of the section as a stock-producing country. This is substantiated by the facts of past experience, and is to be considered in connection with the estimate of an expert of the Agricultural Department, that there are at least 100,000 square miles of tillable and pasture land in Alaska, chiefly in the interior.

The analogy of other countries lying as far north as the Yukon, or farther, referred to by Mr. Brainerd, makes the estimate of Alaska's future agriculture primarily reasonable. Its possibilities rest mainly on two conditions which are entirely overlooked by those who have never lived beyond the lower latitudes. One of these is the high summer temperature, the other the length of the summer day. The attention of the outsider is directed wholly to the excessive cold of the Alaskan winter. He hears of 70° and 80° below zero, and forthwith assumes that the thermometer barely rises above the freezing point in summer. The fact is that a temperature of over 100 is not uncommon, while the average for the short summer is high.

We say "short summer," but that needs qualification. It is short in months and days, but long in hours. When the sun is farthest north, there is, in those latitudes, a period of but from two or three to five or six hours of twilight. Plant life, looking for light and heat, gets as much of them in two months of these lengthened days as it does in four months of the days farther from the Arctic Circle. The working of the law is perfectly familiar to the farmers of Minnesota and the Dakotas, where cereals mature in much less time than farther south. The Alaskan valley, during the brief warm term, is a veritable hothouse, where vegetable growth proceeds by a forcing process to results impossible elsewhere in the same length of time.

All the circumstances, all the experience of men elsewhere, as well as in the few spots of Alaska which the hunt for gold has permitted to be devoted to agricultural

uses, all the well-known physical laws of the seasons and of the germination and development of plants, point unmistakably to the conclusion that Alaska will one day support a large population engaged in tilling the soil and in the care of herds. It may take long to develop, but the immigration induced by gold discoveries will hasten it wonderfully. Meanwhile it is important, and it is just that a true idea of Alaska should be set before the people instead of that which ignorance and superficialism have caused to prevail, even among intelligent men.

REPORT OF ISAAC JONES ON THE RECONNOISSANCE OF THE INTERIOR ALONG THE TRAIL FROM EAGLE TO VALDEZ.

The following report on that portion of Alaska bordering on the mail and Government trails between Eagle and Valdez is respectfully submitted:

I started from Eagle on the morning of September 10 in company with Mr. Oscar Fish, the mail contractor, and one of his carriers, Mr. Al. Paxton. The trail, which is simply a more or less well-marked footpath along which pack animals may be taken, leads off in a southwesterly direction from Eagle to the ridge, which on one side is drained by the Fortymile system, and on the other by tributaries of American and Mission creeks.

The trail here is very good as Alaskan trails are considered. On the lowlands and through the timber the soil is somewhat sandy in character and fairly well drained. Trees that would have interfered in using pack animals have been removed, and it is only where there is a very considerable depth of moss that the trail is wet and at all trying on horses. On the higher ground the trail has very much the appearance of the buffalo paths that used to be so common in the prairie States. It is beaten well below the general level, and has the characteristic windings where there seems to be no good reason why it should not have continued in a straight course.

For 25 miles from Eagle the entire country is broken by small creeks, separated from one another by steep ridges. These streams have, as a rule, very narrow valleys. The hillsides are steep, and in nearly all cases the foot of the incline is close to the stream. In places, the higher ground spreads out in a sort of table-land half or three-fourths of a mile wide; but generally the distance across is not nearly so great, and in some places the ridge is sharp and stony. This hill country is said to have an elevation of from 2,000 to 3,000 feet. The soil in places is a clay loam, usually wet, but more often it is made up of disintegrated granite or slate, and in this section good-sized pieces of the rock are much in evidence.

This portion of Alaska has little to commend it to the agriculturist except perhaps as a grazing country. In general, there is a heavy coat of moss on the surface, but in some places a native grass (commonly called redtop) has asserted itself and would furnish considerable feed for stock.

Throughout this section trees of spruce, birch, alder, poplar, and several varieties of willow constitute the timber growth, spruce and birch being more common than the other kinds. Spruce and alder make rather dense growths on the lower lands, and a spruce tree 14 inches in diameter at the butt is not uncommon. Specimens of alder 25 feet high, and with a 4-inch diameter at the ground can be found all along the streams.

Poplar and birch are commonly found on the sidehills, where the growth is somewhat sparse. Six inches is probably above the average diameter for birch, and the largest poplars in this section have no more than a 10-inch diameter, though in other places trees of this species 20 inches in diameter may be found. In general the lower portions of the hillsides are heavily timbered; the growth becoming less dense as you reach higher ground. The timber land is usually about two-thirds the distance from the creek bed to the hilltops, varying as the slope is north or south. Dwarf birch is common on the highest levels, and patches of scrub willow may be found on very high land. On the highest elevations these dwarfs are very little taller than the bushes of blueberry (*Vaccinium canadense*), which are very common and which bear abundantly. Cranberries (*Vaccinium oxycoccus*) and bear berries (*Arctostaphylos uva-ursi*) are also very common at this season, and may be found at any point from the creek bed to the summits of the highest hills.

At a point about 25 miles from Eagle the trail leads downward, and for several miles passes over a gradual slope which extends from the high ground to the bed of Liberty Creek and as far up and down stream as one can see from the trail. There is about 30 square miles of land here that from the slope of the surface and the character of the soil should be considered very desirable for farming. The slope faces the southwest, hence has a good exposure to the sun. A portion of this slope has been burned over in recent years, and on the land thus cleared of moss very fine native redtop was growing. On patches here and there the stand of grass was thick enough to yield a good crop of hay, and the entire slope would supply good pasturage for live stock.

The soil of this slope is a sandy loam, well drained and generally of good depth, though occasional gravel spots may be found. Portions of the slope are covered by a dense growth of young spruce trees 4–6 inches in diameter. In other parts the timber is sparse. There are few growing trees of large size, but many large trees that were killed by fire a number of years ago may be seen.

The land rises quickly on the south side of Liberty Creek, and after about five hours' travel over hill country we pass to the left of a landmark of note called "The Dome." This elevation is hemispherical in form, and with a very regular outline, considering that the rock

belongs to the slate family. It rises high above the surrounding country, and has an altitude of 4,600 feet. "The Dome" is used as a sort of official guide for travelers through this portion of Alaska, and trails to different sections intersect close to its base. Our camp on the evening of September 11 was close to the "The Dome," and some 35 miles from Eagle.

On the morning of September 12 two of our horses were missing. Several hours' search failed to find them, and Mr. Paxton remained to continue the search, while Mr. Fish and myself proceeded on toward Fortymile. The trail led over a hill country, but the slopes were in general less steep than the hillsides north and east of "The Dome." The slopes here are covered with heavy spruce timber almost to the hilltops, and the trees of poplar are also of good size.

On the evening of the 12th we crossed the Fortymile and stopped at "Pete's Place," at the mouth of Steele Creek. There is no extent of valley to the Fortymile at this point. The banks rise high and rocky above the stream. This flat is closely shut in by high land on all sides, and is seemingly not well placed for a garden spot, but the persons that had planted garden seeds were well pleased with the result. I saw a patch of very good oats that had grown in one of these gardens. The seed was sown in June and it stood 3 feet 6 inches high with well-filled heads of fully matured grain when I saw it in September. We are now in the gold-bearing section of the Fortymile system, though no great amount of gold has been taken from Steele Creek.

On the morning of the 13th a heavy fog prevented one from observing any extent of territory. The mail trail runs somewhat parallel to and above "Jack Wade Creek" for some distance, the creek being on our left and the trail going toward its source. The miners travel the mail trail to and from Steele Creek, and it has happened that travelers who did not know the country have made the turn off to the left into Jack Wade Creek, instead of keeping the main trail toward Franklin Gulch.

Jack Wade Creek and Franklin Gulch are both gold producing, the output each year being considerable. There is no land through this section that would appeal to an agriculturist. The hilltops are stony, the sides are somewhat boggy, and, as far as I could judge, the timber is not good. Mr. Fish has a relay station (a place where horses are changed and provisions secured) at Franklin Gulch, and the carrier who handles the mail between Franklin Gulch and the Tanana station was our traveling companion until we reached the latter place, some several days later.

The mail man is welcomed in all portions of Alaska, and Franklin Gulch is no exception to the rule. Men from the lower claims come to the mouth of the creek in hope of receiving mail or to hear the latest news from the "outside," the mail to be delivered en route

being carried outside the sack. Here I met Mr. John Martin, a pioneer of Franklin Gulch, who is noted throughout the Fortymile country for his hospitality.

The South Fork at Franklin Gulch is neither as deep nor as swift as the main stream of the Fortymile. At Steele Creek we and our goods were ferried across, the horses swimming the stream; but here the horses could wade without difficulty.

Leaving Franklin Gulch on the morning of September 14, we traveled in a southwest direction toward the Upper South Fork. The change in direction of the South Fork, from a northeast to a straight north course, occurs several miles above Franklin Gulch at a point where Walkers Fork comes into the South Fork. From the high points on the trail we could see that above this junction of Walker's and South Fork both of these streams flow through comparatively wide valleys. Along each of these streams is a considerable strip of grass land, close to the stream. In general the grass is distributed on both banks, but it may be mostly on one side or the other, according to the winding of the stream across the valley. These strips of grass land, not more than a quarter of a mile across at the lower end, widen with the valley as you go upstream. After about 10 miles of hill lands the trail leads to a somewhat low rolling country, with gradual slopes. There is a dark sandy loam here, some three inches deep, with a clay subsoil that prevents good drainage, and in consequence there is much water on the surface. This is a good grazing country. The timber, which is mostly spruce and of good size, is not of dense growth.

During the afternoon we passed close to a bend of the South Fork, which is on our left, and for some distance through a very fine patch of redtop, growing close to the stream.

On the evening of the 14th we crossed a small stream called Gold Creek, and stopped for the night at the mail cabin at this place. Gold Creek flows through a valley, the soil of which is largely made up of disintegrated granite. Creek gravel is found in different places on the lower land, an indication that the stream is not always confined within the low banks. Very fine specimens of spruce and cottonwood are growing here. The mail cabin, which is roomy and well made, was built for Mr. Fish by an Indian.

Next morning, the 15th, we traveled for several miles over a somewhat heavily timbered country, mostly spruce, and having a limestone soil. About 10 a. m. we passed from the timber to a grass covered level plain, having a sandy soil. The grass land is about 8 miles across at this point, increasing in width as you go upstream of South Fork of the Fortymile. There are some small patches of "nigger heads" (bunches of swamp grass which year by year form a compact tuft of roots that is several inches above the original level), but

most of the land is well drained, and on this a heavy crop of native grass was growing. Our stop for lunch was at the Indian village of Ketchumstock. This village is located well out in the grass country, and away from all timber. The town is divided by Ketchumstock Creek, which runs southeast into South Fork, and is used as a means for transporting firewood and house logs for the village. The Indians in this tribe are somewhat lighter in complexion than the Yukon Indians, and some of the older men wear long, rather heavy beards. The chief takes great pride in an American flag, which floats from a very respectable flag pole while visitors are at the village. These Indians do not appear to be particularly resourceful, though cabins recently built are a decided improvement over the older buildings in the village. They cross the stream that flows through the village by means of a rude raft. The stream is neither wide nor deep, and could easily be bridged. That the raft does not handle easily, and that it does not always carry the passenger safely to the opposite bank of the stream was, I think, very forcibly impressed upon the mind of a certain member of our party, who got a cold bath while crossing.

In the timber that skirts this grass land the Indians have built a fence that represents considerable time and labor. I have been told that there is over 60 miles of this fence, which is about 6 feet high, and which somewhat resembles the worm fence of certain sections in the States. The fence is built by first laying a row of poles on the ground and then driving stakes on both sides in a slanting position, so that they will rest on and cross above the pole used as the bedpiece for the fence. The forks thus formed are tied with willow withes; the second pole rests in the forks. Other stakes are driven in a more upright position, so that they cross above the second pole, and so on until the fence is finished. Between the forks, if the poles are long, stays are placed in the ground in a perpendicular position, and each pole is tied to the stay. Snares are set in the openings in the fence, and many caribou are taken in this way. There are about 50 Indians in Ketchumstock. This village is located about 110 miles from Eagle and 320 miles from Valdez. During the afternoon of the 15th we continued across the flat country, part of which is very wet, but not at all muddy. We passed through some meadows over which a mowing machine would work without difficulty. On these meadow sections the grass grows tall and heavy, and the entire flat affords excellent pasturage.

Our camp on the evening of the 15th was at the Indian Creek cabin. The cabins between relay stations have been repeatedly robbed of provisions during the summer months, and for this reason we carried supplies from one relay station to the next, no supplies having been placed in the intervening cabins for the summer season. In some way the sack containing our flour, oatmeal, etc., was left outside with the

saddles, at the Indian Creek cabin, and next morning we found that the horses had made a clean sweep. For two days now, or until reaching the relay station at Tanana, bread and mush were omitted from our bill of fare.

Indian Creek is little more than a brook flowing through the grass country; there are patches of spruce timber in places along close to the banks. We crossed this stream on the morning of the 16th, and passed over some very wet country, a great deal of which is nigger-head land. There are evidences of peat formation here. In places fire has burned down 3 or 4 feet below the level; these holes usually are not more than 20 or 30 feet square, and have a soft sticky red clay at the bottom of the pit.

The dry lands between Indian River and the Mosquito Fork, which is a continuation of South Fork, and which we crossed just before noon, somewhat resemble the prairie soil of the Central States. There were patches of very heavy growth of redtop. According to the measurements of a Government party that had passed over a portion of this trail in running a line from Valdez to Eagle, the point at which we crossed the Mosquito Fork is 303 miles from Valdez.

We had a much drier trail during the afternoon of the 16th; we were gradually going up grade across a grass country dotted with patches of scrub willows and small spruce trees. Grouse were very numerous here, as they are the entire distance to Copper Center, 200 miles farther on. The surveying party had marked the distance from Valdez on at intervals of 5 miles wherever a tree could be found for a mile post, and these posts are looked for with interest, though it sometimes happens that one is passed without being noticed.

When we reached the cabin at Wolf Creek on the evening of the 16th we had practically crossed the Ketchumstock Flats. I estimate that there are at least 750,000 acres of excellent grazing country in the valley of the Upper South Fork and its tributaries. About half of this area is sparsely timbered, but is still good grazing land. One can obtain a good idea of the extent of the grass lands from a point a little north and east of Indian Creek; from here the treeless region stretches out for miles in all directions, and seemingly well up the sides of the low hills that almost surround it.

Much of this land could be brought under cultivation as easily as prairie lands of the Middle West. As a money making proposition there is no inducement for one to try farming in this section at the present time; there is no mining camp of importance near, and there would be no market for surplus products. Game is plentiful, however, and the man in whom the spirit of the old pioneer is found might be well pleased with the life he might live here by combining farming, hunting, and prospecting for gold or other minerals. Again, I think stock might be raised here at a very considerable profit; any desired

quantity of hay could be put up for the winter use, and when ready for market the animals could be driven to Dawson or Eagle and shipped in barges to points along the lower river. Perhaps the easiest route to this section at the present time would be from Fortymile Post up the Fortymile trail to Steele Creek and then over the trail we traveled.

Horses have lived through the winter in this grass section on more than one occasion. A Mr. Anderson, of Steele Creek, has a black horse that was taken up last spring after having spent the winter on the Ketchumstock Flats. The Indians told of two horses that were turned loose by a Mr. Holeman in the fall of 1899. These animals have passed two winters in this section, and were seen a few miles from the trail two days before we passed the village.

On the morning of September 17 our path was one of ups and downs, each succeeding grade taking us to greater heights. Just before noon we reached the summit of the divide between the Fortymile and the Tanana Rivers, and we ate lunch some distance down on the Tanana side. Judging from the vegetation, frosts are several days earlier on the Yukon than on the Tanana side of the divide.

Before leaving Eagle I noticed that the leaves of the cottonwood, birch, and alder were highly colored, and had begun to fall. On the Tanana side the leaves of these trees were still green. None of the vegetation showed the least injury from frost. I gathered some very good raspberries here; the berries had evidently been ripe for some time, and though the flavor was good it would have been better had the berries been gathered at an earlier date. The raspberries here differ somewhat from those on the Yukon. Here the bush stands erect and tall, and the berries do not drop immediately after ripening, which is the case with the Yukon variety, the bushes of which do not make an erect growth. Good specimens of spruce and cottonwood are growing well up toward the summit on the Tanana side, the growth being dense in places.

The slope on the Tanana side is much steeper than that on the Fortymile side of the divide. Early in the afternoon we reached the lowlands of the Tanana Valley. For 6 miles the ground is deeply moss covered, and small patches of nigger-head land are passed over. The timber is only fair until we approach Lake Mansfield, where the individual trees are large. This lake is a beautiful body of water, circular in outline, and about 3½ miles in diameter, and having a sandy shore. Water fowls were plentiful and the lake is said to be well stocked with fish. The Indians set traps in the outlet, on the south side of the lake, and large numbers of white-fish are taken in this manner. The salmon does not get up this far. From Lake Mansfield to the station on the Tanana, a distance of 8 miles, the soil is a brown sandy loam, with a sandy subsoil. In general the timber growth is not dense,

though large trees are plentiful, and there are some patches of dense young growth. Close to the river the timber is very good.

There is some good hay land here. I saw some excellent hay that was put up for the mail horses by Mr. Charles Overheiser, who had been in charge of the Fish Brothers' trading station at the Tanana. Grass has not taken this section as it has taken the ground in the Fortymile country, or as it is said to have taken the land lower down on the Tanana. Straggling bunches of grass are found all over the valley. A very thin coat of moss covers the ground, and blueberry bushes make up the undergrowth for a great part of this section.

There are two large log buildings at the Tanana, both belonging to Fish Brothers. One is used as a warehouse and general store, and the other, which was not finished when we passed, will be used as a road house. At present there are no other buildings at this point. The goods for the store are hauled from Fortymile Post on the Yukon during the winter. Next season an attempt will be made to get a small steamer to this point, some 350 miles from its junction with the Yukon. At the Tanana station we are 265 miles from Valdez, and about 170 miles from Eagle. There is a free ferry at this point, which is looked after by the man in charge at the station. This ferry is a great convenience to prospectors or others that pass this way during the summer months. Of course the horses have to swim the stream, which is said to be 500 feet wide at this point, but the boat enables the traveler to keep himself and his outfit dry while making the crossing.

There is a large stretch of almost perfectly level land on the south side of the Tanana. The soil is a dark sandy loam and the subsoil is sandy. I made a reservation of a square mile on the south side of the river, the northwest corner being close to the river, and near the Government trail, which has been cleared of brush to the Tanana. As far as one can see up or down stream from this point, probably 15 miles in each direction, there is no closing in of the valley, and it is at least 20 miles wide here. A large area in this portion of the valley was burned over some years ago. But outside this burnt area, where timber is still alive, there is no underbrush to speak of and the timber generally is small and somewhat scattering.

This land can be brought under cultivation with little difficulty. It is possible, however, that the rainfall in summer is not sufficient for growing crops. The sandy nature of the soil would prevent its retaining moisture for long periods. I was unable to obtain definite information as to the rainfall, but I am satisfied that, barring dry weather, farming may be carried on successfully in the valley of the Tanana. As in the Ketchumstock country, there would be no market for farm products at the present time.

Captain Abercrombie's force of trail makers had reached the Tanana, and turned back a few days before we reached this point. Trail build-

ing across the valley of the Tanana is comparatively easy, as all one need do is to remove the windfalls that may lie across the proposed road, and in some places standing timber has to be removed also in order to get the required width, 12 feet, for the trail. Before reaching the Tanana Valley the task of the trail makers was not an easy one, but the capable manner in which the difficulties that presented themselves were surmounted showed that the men understood their work.

Leaving the Tanana Valley, our course is up the valley of the Tok, in the direction of Mantasta Pass. This valley is several miles wide, and has in places a clay soil very wet. In other parts the valley is stony. There is no agricultural land here, but there are some beautiful specimens of spruce and cottonwood. In crossing the Tok at a point where it seemed necessary to partly unpack the horses, the water being deep and swift, another member of our party had reason to know that Indian rafts are not a safe means of transportation for one unskilled in handling them. When we reached Mantasta cabin on the evening of the 19th, we had crossed, or were then at the summit of, the pass. The lake which lies just south of the cabin is stocked with fish from the Slana River, a tributary of the Copper River. The grade from the valley of the Tanana to this point has been so gradual that it is difficult for one to believe that he has reached the highest point on the trail, between the Tanana and Copper River valleys. Sharp-pointed peaks that rise to a great elevation on each side of the pass convince one that the trail from the coast to the Yukon would have been a difficult one had not nature provided this pass. At Mantasta cabin we found the trail builders; they were camped here for the night. They had no grain for their horses, and were compelled to travel by short stages so that the horses might have more time to feed.

On the morning of the 20th our trail was rocky, in the literal sense, taking us over several miles of cobblestones of granite. Early in the afternoon of the 20th, we reached a point from which the broad valley of the Copper River could be seen, and towards the evening of the same day we saw the stream itself off to the left. We camped outdoors on the bare ground, not having a tent, on the night of the 20th. The mail cabin is some two miles from the Government trail. During the afternoon of the 20th, and all day until the evening of the 21st, we traveled over a slightly rolling country, which was deeply covered with moss, and upon which the timber, mostly spruce, was of small size except close to the streams, and not of dense growth anywhere. Through this section there are many small lakes having small streams as outlets. Nigger-head land is also very common here, and there are certainly many areas of considerable size in Alaska in which agricultural possibilities are more favorable.

The Chestochena River near the mouth spreads out in several channels, over a very wide bed. These shallow channels are constantly

changing, as are also the channels of the Copper, which spread over a wide river bed at this point. The relay mail station is on the south side of the Chestochena River, close to the bank of the Copper, and at the junction of these two rivers. This point is on the route from Valdez to the gold diggings at the headwaters of the Chestochena, some 60 miles to the northwest, and the mail contractors maintain a trading post in connection with the relay station, with Mr. Harry Fane, who also acts as mail carrier between the Tanana station and this point, in charge. This station is 160 miles from Valdez.

South of the Chestochena station the soil has a depth greater than that on the north side of the pass, and here the valley of the Copper is largely made up of broad level benches, that rise one above another as one goes back from the river. Some of these benches are somewhat sandy and probably would be rather dry during the summer months; others would retain moisture for a long period. Prospectors speak with enthusiasm of fine farming lands toward the headwaters of the Gakona and Tazlena rivers, and there is good land near the mouth of each of these streams.

The Gakona is some 200 feet wide, and is crossed by a ferry for men and goods, while horses have to swim. This is a difficult stream to cross, on account of rocks and rapid water. People have been drowned in attempting the crossing.

The Tazlena, the next stream of importance, is easy to ford except in time of high water. From this stream into Copper Center, a distance of 12 miles, there is an especially favorable section from an agricultural standpoint. The land stretches back from the river in level benches, and the soil is a dark rich-looking loam. A good portion of the tract has been burned over the past season and could be cleared easily. There are some large trees, but the timber is mostly small. It is impossible to say how much good land there is in the Copper River Valley. From my hurried trip I have no definite knowledge of the land except that along the trail, but from what I saw, and from the opinions of others that I met and talked to, there is certainly a very large area in the Copper River Valley that is all one could wish for in soil and exposure from the standpoint of the agriculturist. People throughout this section quite generally believe that there is an agricultural future for the Copper River Valley.

At Chestochena station agriculture in Alaska was being discussed, when two old miners who formerly worked in the upper Sacramento district in California entered the cabin. One of them immediately expressed the opinion that the first man who came into the country to farm should be hanged. He blamed the farmers of the Sacramento Valley for the closing of the hydraulic mines on the upper part of that river, and he seemed to imagine that farming in Alaska would be detrimental to the mining interests of the Territory. The same man spoke highly of the upper valley of the Gakona River as a farming country.

About half a mile northwest of Copper Center, near the Government trail, is the southeast corner of a tract of land a mile square that I staked and reserved for an agricultural experiment station by posting a notice on this corner stake.

At Copper Center Mr. Davis, the proprietor of the hotel, showed me some grain that had been grown in the garden of a Mr. Holeman, who formerly was in the hotel business here, and who has settled on 80 acres of land upon which the town is now built. Of this grain oats made a fine showing, there being 3 feet 9 inches of straw, with well filled heads of fully matured grain. Rye stood 6 feet 2 inches high, but the grain though fully formed had been damaged somewhat by the recent frosts. The wheat showed a fine stand of tall strong straw, the grain being in much the same condition as that of the rye. These grains were sown between the first and the middle of June, and would all have made excellent feed. I am told that seeding may begin here early in May, in which case spring rye and wheat will mature, and certainly fall wheat and rye, as well as barley and oats, will mature perfectly. I also saw some grains that were sown rather late in June by one of Captain Abercrombie's men from seed furnished by the Sitka Experiment Station. They were similar to those grown in the garden of Mr. Holeman as regards maturity.

I spent the 23d day of September looking over the surroundings of Copper Center, and I am satisfied that in many respects it is one of the best locations for an experiment station that I have seen. The soil is fertile, can be cleared and worked easily, most of the ground having recently been burned over, and, if I have been informed correctly, there are no frosts in the summer months, and the land is typical of large areas in the Copper River Valley. A station here might be beneficial to the natives of this section; they are not a progressive race and they are the least resourceful of the Indians in Alaska that I have seen. From a physical standpoint they are not the equals of the Indians on the coast or the Yukon Indians; nor are they anything like as progressive. Many of them still live in shelters covered with bark, and their methods of fishing are decidedly crude. The apparatus for taking the fish is a willow basket fastened to a spruce pole. The fisherman walks out on a rude platform, which extends over the stream, and he uses his basket as a dip net. Fish is the principal food of these people, and when the salmon run is light, the indifferent catch that may be made with the basket nets is not sufficient to keep hunger from the camp during the winter. Large game is becoming scarce, and each day the Indians' chances for making a living become less. They seem willing to help themselves if shown how, and it may be that they will plant gardens if they could see that a benefit was to be derived from so doing. If something is not done for them, the Indians of the Copper River will soon have passed away.

There are difficulties in the way of establishing an agricultural

experiment station at Copper Center. The settlement is 103 miles from Valdez, and supplies would have to be taken in overland from the coast in the early spring when prospectors are going into the diggings. The trail would then be good most of the way; but on the summit and on the Valdez side storms are apt to occur at any time, and they sometimes block travel for days. Farm implements would of necessity have to be hauled to the station before the snow goes off. Provisions, of course, can be packed in at any time; but this is expensive. During the past summer season 50 cents a pound was paid for packing goods from Valdez to Copper Center.

Early on the morning of the 24th we again started toward Valdez, 103 miles distant as the Government trail runs. We crossed the Klutena River near Copper Center, over a bridge built by the trail-makers. This bridge is similar in construction to other bridges which span the streams between here and Valdez. Cribs are put in place lengthwise of the stream, one in the center and one on each side of the stream. Bed pieces are placed on these cribs and the bridge is well braced above. The floor is made of poles about 4 inches in diameter. After crossing the Klutena bridge, we turned to the left and followed the bank of the Copper for several miles. A new trail was being opened when we passed along. It joins the original trail above Tonsena Lake, and is built to avoid the swampy land between Copper Center and this lake. Leaving the Copper River bank, we passed over some 5 or 6 miles of heavily timbered country; the moss was not deep here and the soil was well drained and rich-looking, dark in color, with just enough sand to work up easily. The size of the trees would make clearing costly as compared with the amount of labor it would require to clear the land near Copper Center. Grass was growing in scattered bunches through the woods, but there were no patches of any size. About noon we passed close to a lake where the trail men were working, and we had to make our way through the woods to the old trail as best we could, and the task was none too easy. The timber was dense, and chopping was necessary in places in order to get the pack animals through. The day was cloudy, which made it difficult to keep the direction, and the situation was made more confusing by trees that were blazed in a seemingly promiscuous manner, which made it difficult to follow a course in any direction. By this time it had begun to rain, and all together it looked as though we would not reach Tonsena road house by night, as we had hoped to do; but about 4 o'clock a blazed trail that it was possible to follow was discovered, and we were shortly afterwards on the Government trail again, about 6 miles from Tonsena road house. It was dark and raining heavily when we reached Tonsena. This was the only rain we had during the trip. There is a Government bridge across the river at this place.

From Tonsena the trail leads through Kimballs Pass. For several

miles from the river the trail rises gradually over a slightly rolling country having a rather light, poor-looking, and somewhat stony soil. Early in the forenoon we reached a point where snow had fallen the night before, and we had a depth of 2 inches in the pass proper. The grade on each side of the pass is gradual and the elevation is probably not more than a thousand feet above the trail.

After leaving Kimballs Pass the trail is muddy, there being a black muck or boggy soil across the Ernestine Divide, which is really a large, elevated, almost level, and mossy section, from which flow the South Fork of the Tonsena on one side and the Ernestine Creek on the other. We stopped at "The Barns" on the evening of the 25th. At this point the Government has a large barn to shelter horses which it may be desirable to keep at this place during the winter months. A member of the signal corps is in charge of the station. The telegraph line is in operation between Valdez and Copper Center and men are stationed about 25 miles apart along the line. After leaving "The Barns" our course is along the North Fork of the Tiekell River. In places this stream has a valley 2 or 3 miles wide; in other places it is closely shut in by mountains on either side. There are evidences of snow slides at various places along the trail, chiefly in the form of great bowlders that have come down with the snow during the winter season. Soon after crossing the bridge over Stewart Creek we passed up and over a considerable elevation, where the trail was steep, muddy, and somewhat stony. We were now following a mountain pass up the Chena River. Timber here was rather sparse and the trees somewhat stunted in growth. The Chena is bridged at a point where it flows in a narrow bed between perpendicular rocky banks. About a mile and a half from the bridge is station "Number Three," put up by the trail builders, and which consists of two Government buildings. One is used for a storehouse for supplies, the other is a dwelling for the signal-corps man who is stationed here. We remained at this station over night. Next morning our horses were missing, but they were finally found some 4 miles up the trail, near an old mail station, where grazing was good. At this place I saw timothy grass that stood 3 feet high. The seed had evidently been scattered from hay that had been fed to the mail horses. The elevation here is about 3,000 feet, and glaciers may be seen in a number of different directions. I counted 6, none of them distant. We had intended to make it into Valdez on the 27th, but the action of our horses delayed our start. The grade to the summit is a gradual one and the climb is not at all difficult. Near the head of Ptarmigan Creek, well up toward the summit, the land stretches with a gentle upgrade in all directions from the creek bed, and here the ground is grass-covered, the land is somewhat marshy, and the vegetation is like swamp grass in appearance. We had a fine day for crossing the summit, and the scenery, as the trail led over low

elevations, each of which we had considered would take us to the summit of the pass, was most interesting.

There is so much sameness here and such a lack of definite landmarks that it is difficult to follow the trail after snow has fallen. One is much impressed with the danger and difficulty that a traveler would encounter in crossing the summit during a storm. The summit is some 2 miles wide and is about 25 miles from Valdez. The trail down into Dutch Valley, which is a sort of basin to which the mountain sides slope in the direction of Keystone Canon, takes a somewhat winding course, but the grade is gradual. A portion of the trail had caved off, in one place leaving a narrow ledge close to the bank from the side of which the trail had been cut. There was room on this ledge for a horse without a pack, but an animal with a large pack would likely be crowded over the bank, which was about 15 feet high. Two horses with large loads had been crowded over the bank the day before we passed. Our horses had very small packs now, and it was considered safe to take them across without unpacking. This opinion proved to be correct. A little farther on a glacial stream had to be forded. This stream was not deep, but the bed was lined with bowlders, over and around which the water rushed rapidly. Formerly there was a bridge here, but high water had carried it away. There is some very fair timber in this part of the valley, a scattering growth of grass, and the undergrowth that is common along the southeast coast of Alaska. A few small garden spots may be found here, but there is no extent of farming land. The soil is a disintegrated granite and in most places is stony.

We had intended to stop for the night at Workman's road house, some 18 miles from Valdez. On reaching this place, however, we learned that the *Bertha* was due to sail from Valdez the next day. The moon was at the full, and as there was a prospect that our good weather would not last much longer we concluded to travel by moonlight. After allowing the horses to rest for several hours we started, about 9 o'clock, on the last stage of our journey to Valdez. The moon shone dimly through a thin layer of cloud, giving sufficient light to enable one to follow the trail without difficulty.

The scenery in the canyon was impressive. There was no wind stirring, and the moonlight striking through the clouds gave a sort of weird appearance to objects along the trail, which winds back and forth along the wall of the canyon, now approaching the river and again going from it. The night was filled with the sound of rushing waters, and the mountain streams, which in places fall almost perpendicularly for several hundred feet, appeared like long bands of white upon the mountain side. The effect is greatest at points on the trail where one can look from some narrow ledge almost straight down on the river far below.

The trail through the canyon was the most difficult task the trail builders had to encounter, but here as elsewhere the work was well done. The Government trail from Valdez is a great help to one going into the interior. Good work has been done as far as the Tanana River, 265 miles from Valdez, and while the trail is far from being a good wagon road in the summer months, it will afford a splendid sled road, and even wagons could be used before the frost leaves the ground in the spring. To one who knows anything of trail building in Alaska the surprise is not that the trail is no better, but rather that it is as good as it is. After leaving the canyon we traveled down the bed of the Lowe River, which spreads over a large gravel flat. In places the trail led through timber for a short distance, and here the large trees, clear of branches for 50 feet, and the large rank ferns which grow in great masses, cause one to forget for a moment that these are Alaskan products.

We reached Valdez on the morning of the 28th, and I sailed on the *Bertha* about noon the 1st day of October.

ISAAC JONES,
Assistant, Alaska Investigations.

Prof. C. C. GEORGESON,
Special Agent in Charge of Alaska Investigations.

NOTES AND COMMENTS ON REPORT OF MR. JONES.

This report by Mr. Jones is the first attempt that has ever been made to describe the agricultural features of the region which it covers. He gives a succinct and systematic account of those features in the territory he passed through which would naturally be noticed by an agriculturist. The character of the surface, the kind of soil, its slopes and exposure to the sun, the vegetation, the water courses, the drainage of desirable tracts, distances, and the character of the trail. He points out the unfavorable features as well as the favorable ones. The sharp, uncompromising mountain ridges which cover large areas; the steep and rocky hillsides, and the wastes of bog and marsh land are noticed as well as the great meadows and the expansive valleys of fertile alluvium. He notes also the few natives which inhabit this region, their condition and their prospects. It is to be observed that this reconnoissance covers only the region which can be seen from the trail. Broadly speaking this is a strip about 30 miles wide by 435 miles long, the distance between the two terminals. Outside of this strip we know as yet little or nothing as regards the areas available for farming and grazing; but it may not be unfair to assume that the region south of the Yukon will average about as the strip here described. If we follow the sixty-third parallel from east to west, which nearly bisects this vast region, we shall find that the distance in a straight line from

the Canadian boundary to Bering Sea is more than 600 miles. It therefore contains twenty times the area covered by this description, and presumably the same ratio also holds good for land which may have value for farming and pasturage.

There are in this region besides the Copper and Tanana rivers the Sushitna and Kuskokwim, both of which are known to have extensive valleys. Captain Glenn, of the United States Army, explored the Sushitna in 1899, and he reported that the valley was 50 miles wide, and that some of its tributaries had also very broad valleys.

The Kuskokwim we know comparatively little about beyond the general facts that it drains a region even larger than that drained by the Copper and that its valley is in places very broad. These facts, taken together, scarcely admit of a doubt but that there are many very extensive areas of land which may have value for the farmer and grazier in the region south of the Yukon. Nor is it to be doubted that the best land from an agricultural standpoint, and the best climatic conditions which the interior affords, are to be found here.

The leading characteristics of the strip covered by Mr. Jones's report may be conveniently grouped under three heads, corresponding to the three natural divisions outlined by the drainage systems; namely, the Fortymile country, the Tanana Valley, and the Copper River region. And as each has some features which are in a measure peculiar to itself, it may be well to review them briefly.

THE FORTYMILE COUNTRY.

The Fortymile River is a considerable stream which empties into the Yukon some 50 miles below Dawson, and almost equally distant from Eagle, the first town in American territory. At its mouth is a small settlement called "Fortymile." From this point trails lead up toward its source, and to many of its tributaries, which are among the first gold-bearing creeks discovered in Alaska. Only a short distance of the lower portion is in British territory. Its entire drainage system lies in Alaska. Its general course is in a northeasterly direction, though the north and south forks, its two leading tributaries, run almost directly east, and the latter even runs southeast in a portion of its course.

The Fortymile makes but an inconspicuous stream on the map, but it nevertheless drains a large area, many small creeks radiating from it, not unlike the venation of some leaves. For a distance of about 25 miles from Eagle these small tributaries cut up the country into a series of narrow ridges, which can have but little value for agriculture. Their sides are for the most part too steep and rocky to admit of anything more than garden patches for cultivation, and they are also quite generally rocky and barren, so as to produce but little pasturage.

Having passed this region we come to the first considerable tract which may be of value for the farmer.

This is an extensive gentle slope facing toward the southwest, and which Mr. Jones estimates contains not less than 30 square miles. That amount of good land is in sight, but how much more there is must for the present remain a matter of conjecture. As far as examined the soil was found to be a sandy loam; that is, what is usually classed as a "warm" soil, and the kind one would require for the rapid growth of crops; and much of it is covered with a heavy growth of native grass, which is in itself proof that the ground is productive. Nor is timber wanted to supply the needs of the settler.

Liberty Creek, which drains this slope, runs in a southeasterly direction, and flows into O'Brien Creek, which in turn empties into the Fortymile. It carries considerable water. When Mr. Jones passed the stream was about 30 feet wide, and would average a foot in depth, and the creeks were not swollen at the time.

About 10 miles farther on the base of "The Dome" is reached, the trail passing to its left. From this landmark for a distance of 23 miles, until the trail crosses the Fortymile at the mouth of Steele Creek, is a region of rolling country, with low, round-topped hills. The whole region would afford much pasturage. Grass was found everywhere interspersed with wooded slopes, and here and there tracts from which farms could be carved. Here, then, is a tract approximating 700 square miles, or, in round numbers, 450,000 acres, which would have considerable value as a range for live stock during the summer months. How much larger the area may be can not be stated at present, as we can speak with certainty only of that portion which was in sight, and which averages about 15 miles on each side of the trail.

Steele Creek enters the Fortymile from the south at this place. The latter stream, running due east and west, is for a portion, at least, the boundary of the range country just described.

For the next 22 miles, from the mouth of Steele Creek to Franklin Gulch, the country is more rugged and broken, and has for the most part very little value for either the farmer or the grazier.

It was at the mouth of Steele Creek that Mr. Jones saw, on the 12th of September, what he describes as a small patch of very good oats. It stood 3 feet 6 inches high, and had good heads of fully matured grain. This little patch of ripe oats speaks volumes for the possibilities of the country. The seed was sown in June, he was informed, and it had therefore grown to full maturity in a hundred days or less. These oats were doubtless such as are brought into the country chiefly from California and Oregon for horse feed. The chances are, therefore, that it was not an early variety, but such as is commonly grown in California. If common oats will mature there, it is certain that

barley will also do so. And it is almost certain that spring wheat and spring rye can be grown there with equal success. In other words, these oats practically proclaim that it is possible to grow all the common hardy grains in that region, at least in the valleys and on the southerly slopes of the hills. The Fortymile at the mouth of Steele Creek is a respectable stream, even when not swollen by freshets. It is about 260 feet wide, and very swift.

From this point to Franklin Gulch, a distance of 22 miles, as already noted, and for 10 miles the other side of Franklin Gulch, the trail runs through a rugged and almost worthless region from the standpoint of the farmer. Franklin Gulch has no valley land, but about 10 miles from the creek to the southward the northern boundary of an extensive region which may prove to be some of the best country in the interior is reached. This tract comprises the "Ketchumstock Flats," which Mr. Jones describes quite fully. He estimates that there are 750,000 acres, half of which could be brought under culture with ease. In reality the area of good range country is much greater.

Beginning about 10 miles south of Franklin Gulch, or about 90 miles from Eagle, the trail runs through this rolling, grassy country for 60 miles, or to within 20 miles of the Tanana River. It is in large measure a rolling country with gradual slopes. Much of it is wet, owing to an impervious subsoil; but it is a good grazing country, and "the timber is of good size and of dense growth." In the center of this area is a grass-covered level plain about 8 miles across and increasing in width upstream. A portion of it is what the prospector calls "nigger-head land." These nigger-heads are bunches of sedges which grow in wet places, usually where seepage water from higher ground comes to the surface. The bunches or heads usually stand from a foot to a yard or more apart, and in the course of years each becomes a compact mass of roots which gradually rises from the surface to the height of a foot or more, and it may measure as much in diameter. When the dry tops are burned off it leaves the scorched and blackened heads, which may have suggested the name.

Nigger-head land is of no value for cultivation, or even for pasture, until thoroughly drained, and drainage would be too costly an operation for settlers to undertake until the country is peopled to such an extent as to cause a rise in land values. However, these nigger-head lands do not occupy any considerable portion of this vast tract. Good pasture can be found over nearly the whole area, and the Ketchumstock Flats, the boundaries of which are not fully known, can be brought under culture with as much ease as the prairie land in the west. It is in this grass country that horses have wintered successfully several times. Mr. Jones mentions two instances which are well authenticated. In one case two horses had gone through two winters and still roamed about there in a semiwild condition. Another instance was told me by a miner, Mr. Mark E. Bray, whom I met on

the Yukon. He makes his headquarters at Dawson while his mining interests are on the Tanana, and he packs his supplies out from Dawson. He informed me that in the fall of 1899 he left five mules at the head of the Chusana River, which is perhaps 75 miles to the southeast of the Ketchumstock Flats. In April the following year he found four of them sound and fat; the fifth had been killed by the Indians.

I have recorded similar instances in former reports. These facts prove that the winters are not so severe but that horses and mules can live through them in the open, and that there are large stretches on which they find enough feed to sustain life in spite of the snowfall.

The snowfall in Ketchumstock Flats and Tanana Valley is reported to be considerably lighter than on the Yukon, where it averages from 2 to 3 feet. It might be reasonably expected that the snowfall in the interior would be light, inasmuch as the region is far from the sea, and to the south and west it is bounded by high mountains along the coast, which would cause a precipitation of the moisture in the air before it is carried inland. The creeks traversed by the trail through this section are successively Ketchumstock Creek, Indian Creek, Mosquito Fork, and Wolf Creek.

Ketchumstock Creek was at the time Mr. Jones passed about 60 feet wide and 3 feet deep. It runs through the Indian village from which the region takes its name. About 10 miles farther on, Indian Creek is reached, which is only a very small stream, about 6 feet wide. It may be of importance as a source of water for stock raising. About 12 miles farther on the trail crosses Mosquito Fork, which is the name given to the upper portion of the South Fork of the Fortymile. It was so named because of the myriads of mosquitoes which infest the region. At this point the creek has an easterly course, and Mr. Jones found it to be about 150 feet wide and 4 feet deep. It has its source in the divide which separates the Fortymile country from Tanana Valley, and is fed by numerous small creeks.

Wolf Creek is a very small stream, the last crossed by the trail before the divide which separates the Fortymile system from the Tanana Valley is reached.

So far as known, cattle, which the Indians call "McKinley moose," have as yet not been introduced into this region. Some cattle have, however, been driven into the Copper River Valley. And in this connection it may be mentioned that some enterprising person drove four dairy cows into the mining section of the Chestochena the past season, and later they were driven back to Valdez. What success attended the enterprise was not learned.

THE TANANA VALLEY.

The Tanana Valley is separated from the Fortymile country by a divide, which on the north side rises in successive elevations of low, round-topped mountains covered with vegetation. It is not a stony,

rocky ridge; there is scarcely an elevation which could be called a peak in sight along the divide, and yet it is too rough to have any agricultural value, except as a range for sheep and goats. On the south side the valley is likewise bounded by a divide, which separates it from the region drained by the Copper River system. This divide is decidedly more rugged than the one on the north side, but still it has no high mountains with glaciers or snowy peaks. In the middle of September, when Mr. Jones passed through, some of the highest elevations had just been capped with fresh snow, but during the summer there are no snowy mountains within the region under consideration. The distance from the top of the ridge on one side of the valley to the top of the ridge on the other is about 50 miles. Between the two lies the Tanana Valley proper.

The river takes its rise in the same elevated portion of the coast range from which the White River and the Copper River also spring. The White River runs almost due east, and soon enters Canadian territory. The tributary of the Copper which rises here runs west until it joins the main river; and the general direction of the Tanana is northwest.

The Tanana is a large river, which measures in a straight line from source to mouth more than 400 miles, and counting the windings it may be twice this length. It is of varying width, but generally spreads out from half a mile to 2 miles in width. In the lower half of its course there are numerous islands. At the point where the trail crosses the stream is about 500 feet wide and moderately swift. The water carries much sediment and is of a milky color at this point, indicating that some of its upper tributaries take their rise in a light-colored clay soil. The valley proper, from base to base of the two divides which hedge it in, is about 25 miles wide. It is almost a level tract, with but a slight and very gradual rise from the stream toward the divide. The banks are about 15 feet high above the stream at normal level of river. So far as known the river does not overflow these banks at any time, but we have no definite knowledge on this point. Where the trail crosses the river is in about the middle of the valley.

The valley in the belt under consideration is for the most part covered with a sparse and scattering growth of spruce, with some poplars. The forest can scarcely be said to be continuous, as there are many small patches of open meadow. Near the river, and especially in low places in the bends of the stream, the growth was the densest and the timber the largest; spruce trees 18 and 20 inches in diameter were plentiful. On the dry land away from the river the timber was smaller, and the growth open and scattering. There was very little continuous grass land in sight, but scattering bunches of grass everywhere. A low straggling blueberry bush was abundant, where not crowded out by the spruce, and a very light coat of moss covered the ground. The

soil is a dark, sandy loam, and in the valley proper there was no nigger-head or marsh land too wet for cultivation. It will probably be found that the greatest drawback to cultivation is a lack of rain during the growing season, although on this point we have no definite information. As soon as settlers come in, who will undertake the work, meteorological stations should be established, not only here but in the Fortymile farming region, and in the Copper River region. How broad the valley is above and below the belt under consideration we do not know, but to judge from the mountains in sight it is as broad or broader than at this point.

Mr. Jones makes the important observation that this valley appears to be milder than the Yukon Valley. He saw no evidence of killing frost there in passing over the valley on the 17th and 18th of September, while in the Yukon Valley there had been several killing frosts before that date. This evidence is confirmed by other observers.

Mr. J. L. Green of Rampart, in a letter submitted with this report (p. 309), makes the same observation. He states in effect that the spring begins earlier, and the autumn frosts set in later in the Tanana Valley than on the Yukon. And Mr. Erastus Brainerd states in an article published in the Seattle Post-Intelligencer of September 29, 1901, that in the spring of 1900 the ice broke on the Tanana in the second week of April, while it did not break on the Yukon until the third week in May, and also that during the latter half of May he found ice and snow in the Yukon Valley, whereas in crossing the divide into the Tanana Valley he found the redtop grass as high as his shoulder, and lupines and vetches in bloom.

Briefly stated, all evidence so far brought forward is to the effect that the Tanana Valley has a considerably longer growing season than the Yukon Valley. And the chances for success in farming are correspondingly greater. So far as the writer has been able to learn, no attempts at gardening or grain growing have as yet been made by anybody in the Tanana Valley. There is a very promising and extensive area of agricultural land there, but the possibilities of soil and climate have not been tested.

THE COPPER RIVER REGION.

As already noted, the divide which separates the Tanana Valley from the Copper River country is quite high and in places rugged. The trail runs through a low rolling cut in the mountains, known as "Mantasta Pass." The region drained by the Copper River differs from the Fortymile and Tanana Valleys in that it is more broken and more extensive.

On the south it is bounded by the coast range, on the east and north by the watershed which separates it from the Tanana, and on the west by a divide which separates it from the Sushitna. The river rises in

the coast range and flows first northwest, then west, and finally south, in the shape of a great sickle. It has numerous tributaries from both sides, and some of these flow through more or less extensive valleys of what appears to be good agricultural land. However, that portion of the Copper River country embraced in Mr. Jones's report lies almost wholly to the west of the main stream. The region to the east of the main stream we know but little about, except the general report of prospectors that there are extensive tracts of level or rolling land.

For a distance of some 12 or 14 miles from Mantasta Pass the trail leads down the divide, then a stretch of low rolling country is reached. This stretch of between 30 and 35 miles may some day perhaps be set tled by farmers; at present it appears to be too marshy. It is covered with a deep coat of moss, and small lakes, meandering streams, and nigger-head bogs are numerous. This stretch of country ends at the Chestochena River. From that stream to the Tazlena there is a gradual and marked improvement in the country. The ground is less marshy, the moss not so deep, patches of grass are more extensive, and the timber along the stream is larger. Between the Chestochena and Tazlena is a stretch of about 45 miles which in general may be described as a timbered country, with patches of grass land ranging in size from a few acres to a hundred acres in extent. The cost of clearing the timber off the ground would perhaps be the greatest bar to settlement outside the patches of grass.

Nearly midway between the Chestochena and Tazlena rivers a stream called the Gakona comes in from the west. In the upper portion of this river, prospectors informed Mr. Jones that there were large stretches which had a luxuriant growth of grass, and I have since had this statement confirmed by another prospector who had passed through a portion of it. He said he walked over a stretch of level ground with a heavy growth of grass at least 5 miles in width; how long it was he did not know. This grass land is about 100 miles west of the belt we are here discussing.

From Tazlena to Copper Center there is a stretch of 12 miles of most excellent agricultural land. The land lies in benches, one slightly above the other, which will average from half a mile to a mile in width. The soil is a dark sandy loam with a subsoil containing more of clay than on the surface.

There is no swamp land in this stretch or anything in the nature of waste land. It is partly timbered with spruce, but the growth is young and not dense. Fires have been through the whole region, which have cleared the ground of moss and killed the young trees. The land can therefore easily be cleared. The same kind of land, in all respects, continues southward for another 12 miles, the difference being that the timber is larger, denser, and is all alive. It will

therefore be too costly to clear a farm in this region for a long time to come.

The Tazlena River may really be considered as the center of the best agricultural region in the Copper River Valley and within the boundaries of the strip we are discussing, although the best portion of that region lies between the Tazlena and Copper Center, as noted.

From a point 12 miles south of Copper Center to the Tonsena River, a distance of 13 miles, is a rather wet rolling country more or less densely wooded, with small marshes in places, with a heavy coat of moss on the surface and only scattering bunches of grass. It has some value for pasturage, but can not be considered first-class in this respect.

From Tonsena River to Valdez there is practically no agricultural land and comparatively little pasture land. The trail here crosses the coast range; the best portion is the north slope of the range from Tonsena River to Kimballs Pass, a distance of about 9 miles. Here goats and sheep may find pasture. It is not likely even to become a good range country. The soil is light yellow, gravelly in nature, and abundantly covered with stones as large as one's fist.

From Kimballs Pass to Valdez the country is simply a succession of ups and downs, interspersed with rugged peaks and many glaciers, deep canyons, waterfalls, and mountain torrents. In short, it is typical of the scenery that may be found anywhere along the Alaskan coast range, and which from the sea looks so strangely grand and at the same time impresses one as a forbidding waste.

The leading streams which enter the Copper River from the west, and which were therefore crossed by the trail, are the following, in order from north to south: The Chestochena, the Gakona, the Tazlena, the Klutena, and the Tonsena.

The Chestochena is a considerable stream. At high water near the mouth it is about a mile wide, but, except when swollen, the water does not cover the bed, but runs through in a score of different channels. From this river to the Gakona is a distance of about 25 miles. The Gakona is about 250 feet wide; the bed is filled with large bowlders and the water rushes over them in torrents, which makes it a difficult river to ford, and at high water it is dangerous, if not impossible, to cross it. As a matter of fact this can be said of all the streams. From the Gakona to the Tazlena is about 20 miles. This is a small stream in comparison with the two foregoing. It is only about 60 feet wide, nor is it deep, and it can be easily forded at low water. From the Tazlena to the Klutena at Copper Center is a distance of 12 miles. The Klutena is like the Tazlena in size and in the volume of water it usually carries. It has been bridged by the Copper River Exploring Expedition under command of Capt. W. R. Abercrombie, who for three years past has been employed in exploring the Copper

River Valley and in constructing a trail. North of the Klutena none of the streams has so far been bridged. From the Klutena to the Tonsena is a distance of about 25 miles. The Tonsena is a little broader than the Klutena and carries perhaps a somewhat greater volume of water. The mountain streams in the coast range have all been bridged. The Government trail has been cleared to the Tanana River.

The Government telegraph line, which is also under construction, has been completed across the coast range to Copper Center, and is in operation.

Copper Center is a collection of about a dozen log cabins, situated in a small clearing on the north side of the Klutena River. It had its origin in the influx of prospectors which came into the Copper River Valley in search of wealth, in 1898, though at that time the settlement consisted almost entirely of tents. There was at one time several hundred people here, and during the winter of 1898 and 1899 most of those who wintered in this camp suffered greatly from scurvy and many died of this dread disease. At present most of the cabins are empty. Some few prospectors make their homes here temporarily. The Copper River Exploring Expedition has a storehouse and a few men stationed here, and there is also a road house, or so-called hotel, in the place, kept by two men.

Aside from Copper Center and the mail stations described by Mr. Jones, there are no other settlements in the Copper River Valley. During the summer season there are from 150 to 200 men in the placer camps of the Chestochena and its tributaries; and a score or more men are likewise at work during the summer on the very rich copper deposits which have been found in this region, but as yet there are no permanent settlers. That the country can produce grain is proven by the fact that Mr. Jones saw ripe oats in a garden at Copper Center.

In the judgment of the writer, the Copper River Valley has a great future. It will one day be a rich and flourishing country, and perhaps the most populous region of the future State of Alaska. Here are opportunities for thousands of families to make homes for themselves and gain independence. But before settlers can be attracted to this or any other region in Alaska the Government will have to survey the country and make the homestead law so liberal that it will be possible for poor men to take up land.

Before closing this subject a word should be said about Valdez, which is the southern terminus of the trail. If the country in the interior is opened to settlement, Valdez is almost certainly bound to become a large and important town. It lies at the head of a bay which is open the year round, and naturally it must become the port for all the traffic going in and out of the interior. Valdez is even now a vigorous and enterprising young town. There are many good houses

in the place, and the people have begun to build large and ornate churches. The town has good hotels, good restaurants, good stores for all kinds of merchandise, and is settling up with an enterprising class of people. It is not a costly place to live for the accommodation afforded. The traveler can perhaps live cheaper here than in any other place in Alaska. The writer has eaten an excellent meal at a public restaurant for 35 cents. The town is built on a gravel flat which extends back for 4 miles and there terminates in the Valdez Glacier. I present a view of the town herewith (Pl. XIX, fig. 1), taken from a boat in the harbor. In this view the glacier seems very near, but, as noted, it is 4 miles distant.

Five miles from Valdez, on the shore of the bay, in a pretty little nook under the mountain, the Government has built an army post, which has been named Fort Liscum. With its stables, warehouses, barracks, and officers' quarters, all laid out in streets, the fort appears almost like a small town in itself. The buildings are unpretentious, but have a substantial appearence, and everything has an air of superlative neatness which is characteristic of all Government posts.

NOTES ON THE COPPER RIVER COUNTRY, BY MAJ. W. R. ABERCROMBIE.

Maj. W. R. Abercrombie (then Capt., Second United States Infantry) has been in charge of the construction of the military road which is now building between Valdez and Eagle. As noted in the foregoing, this road has already been completed as far as the Tanana River, a distance of 265 miles from Valdez. The Major has spent three years in the Copper River country, and is, of course, thoroughly familiar with all its characteristics. He is of the opinion that it affords excellent opportunities for farming. In fact, he has done some quite successful experimenting. He has raised good gardens, both at Valdez and in the interior. The following letter explains the situation briefly:

TRANS-ALASKAN MILITARY ROAD,
Fort Liscum, Alaska, November 20, 1901.

SIR: I sent you by steamer *Newport*, care of Captain Moore, a sample of Finnish black oats grown in the Copper River Valley at Copper Center from the seed sent me by you last spring. The wheat matured, but was trampled down by my beef cattle. All the vegetables grew and matured. The inclosed photograph will give you an idea of the garden, which was on new ground burnt off last May.

Very respectfully,
(Signed)

W. R. ABERCROMBIE,
Major, Thirtieth Infantry.

Prof. C. C. GEORGESON,
U. S. Department of Agriculture, Sitka, Alaska.

At my request the Major has kindly sent me the following as an expression of his views on the agricultural possibilities of the region through which he has been operating:

AGRICULTURAL POSSIBILITIES OF THE COPPER RIVER VALLEY AND ITS ATTRACTIVE FEATURES FOR THE SMALL FARMER.

Having watched for the past twenty years the growth of our former Northern frontier, i. e., Dakota, Montana, Idaho, and Washington; having traversed the Yellowstone, Gallatin, Spokane, and other valleys prior to the advent of the rancher and the railroad, I feel qualified in a measure to give an intelligent opinion relative to the capabilities of the soil and the prospects of the small farmer who is constantly on the move in the search of a home in a new country.

I find the conditions as varying in different parts of the Copper River Valley as the great range of climatic conditions would naturally dictate. The disappearance of the snow and the sprouting of the grass varies at least forty-five days in different portions of the valley. Along almost every route that has been traveled by pack animals will be found scattering spears of timothy and grain.

I shall first consider the route traveled by the pioneer horsemen of the season of 1898, as that was the only year in which pack animals were used over the route from Valdez to Copper Center via the Valdez Glacier and Klutena River. During the past season spears of timothy and grain were found along this trail, which would indicate that the original seeding of 1898 reseeded itself, with the result of a volunteer crop in 1900, which to my mind is conclusive evidence that, when acclimated, grain and hay will both mature and bring forth abundant crops. From the evidence obtained in a small experimental garden it is an assured fact that potatoes, turnips, beets, peas, lettuce, radishes, and possibly many other vegetables will grow in abundance when the proper soil, exposure, and drainage are obtained. As the existence of the small farmer is conditional on the laws of supply and demand, it will be necessary, too, in this instance, having found the supply, to point out the probable demand. Two hundred and fifty miles inland from Port Valdez, in a northerly direction, lie the gold fields of the Chesna mining district, which, in my opinion, in the next few years will produce many millions of dollars of gold dust.

There is to-day, aside from the 200 or 300 head of horses, the property of the Government and individual owners, absolutely no means of transportation between these two points—Valdez and the headwaters of the Chestochena River. A pack animal loaded with forage at Valdez, if no means of subsistence were to be had en route, would consume more than the forage he could pack before reaching his destination, which fact is attested by the scores of dead horses whose carcasses mark the advancement of settlement along the Trans-Alaskan Military Road. Hay and grain to-day at Port Valdez, original cost and marine transportation added, will average $40 per ton. This forage can not be transported into the Copper River Valley to the crossing of the Tonsena for less than 25 cents per pound, and then the margin to the freighter is extremely meager. Therefore the opportunities to-day awaiting the small farmer who will select his homestead judiciously along the Trans-Alaskan Military Road, with a view of erecting thereon a bunk house and barn for the accommodation of man and beast, and the cultivation of forage for the animal and the vegetable produce for the man, is, in my opinion, so much more enticing than the inducements held out for the bleak prairies of Dakota or the wind-swept valleys of the Yellowstone as to be beyond comparison.

Referring to my report of 1899 on this subject, I would say that I am more profoundly of the opinion to-day than ever before that the valleys of the subdrainage of the Copper River Valley will in future years supply the demand for cereals and vegetables, if not meat, of the thousands of miners that will be required to extract the vast deposits of metals from mother earth in the Chettyna, Kutsena, and other districts. Referring to the available arable land for the cultivation of forage, I shall eliminate the coast range entirely, for the reason that, owing to the heavy fall of snow the spring is generally one month later than in the Copper River Valley, the crest of

the mountains being capped, as they are, with monster glaciers, cause daily precipitation from the 1st of July until freezing weather in October. While vegetation and fodder grow luxuriantly in the coast range district, forage must be treated as silage, as, owing to the constant rain, it can not be otherwise cured.

Following the South Fork of the Tonsena will be found thousands of acres of available land for cultivation, which, having been burnt over years ago and divested of its covering of moss, needs only now to be cleared of the dead spruce timber that encumbers it, when it is ready for the plow. Five miles north of the Tonsena bridge are tracts of land well timbered and drained that are likewise available for agricultural purposes. A few miles north of the mouth of the Tazlena is a stretch of sandy, loamy soil with a southern exposure that looks attractive. At the mouth of the Tonsena River is a large hay meadow many hundreds of acres in extent on which quantities of hay could be cured. I desire to point out in this connection that a few experimental stations, with competent persons to test the soil and collect such evidence as would enable the settler to intelligently locate his homestead, could not be established at any point to better advantage by the Government than at one of the points mentioned above. * * * In my opinion the backbone of the settlement of this mighty valley is its agricultural resources.

NOTES ON THE TANANA VALLEY, BY MR. J. L. GREEN.

Having learned that Mr. J. L. Green, an attorney at Rampart, had made a somewhat extended tour through the valley of the Tanana River, I asked him to write me a statement of his views concerning the agricultural features of that region. This he kindly complied with in the following letter:

RAMPART, ALASKA, *April 22, 1901.*

DEAR SIR: Your letter of March 17 received to-day. In reply would state that I will most cheerfully furnish you all the information I can in regard to the agricultural possibilities in the Tanana country; but owing to the fact that I have not been able to experiment any in growing cereals there, my opinion would not be worth as much to you as a statement of the facts regarding that country. However, I will state both, and the opinion you can take for what it is worth.

I had heard a great deal of the country before I made my trip through it, but was pleased to find a better country than I anticipated. The country has a great many large valleys ranging from 5 to 20 miles in width and from 10 to 50 miles in length. The timber is far superior to any I have seen, either in the Yukon or in the Northwest Territory.

I also found very extensive prairies, dotted with lakes. The lakes and swamp lands would perhaps occupy one-half and sometimes probably more than half of the surface of the prairie lands; the higher ground I found dry and of a dark-brown color, and consisting of a sandy loam and very fertile.

This soil was covered with a rank growth of grass (this grass is perhaps the same as the redtop grass or herd grass we have in the States), although the same variety is found in every part of Alaska. I have not been able to find anything in any other part of the country to equal it either in quantity or quality. This grass grows to the height of from 4 to 4½ feet, and will produce from 2 to 3 tons of hay per acre. There are places where a mowing machine can be driven for 5 miles in one direction without lifting the sickle bar.

The surface of the soil thaws from 4 to 10 feet during the summer season. I was in that country during the months of August and September of last year. When I left the last of September there had not been sufficient frost to kill the leaves on the trees, although it would have killed potato vines and all the more tender vegetables.

There was a great deal of rain during September, but no snow. As I neared the Yukon I saw a great change, showing signs of heavy frosts, and when I arrived at Fort Gibbon I learned that they had had considerable frost, and quite a snow storm some two weeks before I arrived, some of which was still visible, especially on the north side of the hills and in sheltered spots. I also learned from the Indians and from white persons who have been in the country in the spring that the season is almost a month earlier than anywhere on the Yukon River.

I am informed that the Chinook winds from the coast, across a low divide in the coast range, clears that country of the snow very early. I know this, that the Tanana River breaks and clears of ice at least two weeks earlier than the Yukon; so evidently the season must be earlier.

As fine a quality of hay can be produced there as can be produced anywhere. I believe spring wheat, oats, and barley will mature there if properly handled. I know that potatoes, cabbage, peas, beans, turnips, carrots, onions, radishes, beets, and a great many other vegetables can be produced there.

Having been reared on a farm in a new country, I have taken quite an interest in and a great deal of pains to learn if agriculture could be successfully carried on in this country; and having traveled over a great deal of the territory, always taking notes of the country I passed over to satisfy myself as to the agricultural possibilities, I must confess that the Tanana country is the only part of Alaska where I believe agriculture could be successful. There can be no doubt about it. The only thing would be to convince the farmer that he must not farm as he does in the States, but must use his head as well as his hands.

To succeed there the soil must be prepared in the fall, and nothing left on the surface to prevent the rays of the sun from striking the soil as soon as the snow disappears. I find from experience that the sandy loam is a better conductor of the heat than the muck, or soil free from sand; that it will thaw from a foot to 18 inches, while the soil composed entirely of vegetable matter will not thaw more than 3 or 4 inches. I find that the nature of the soil and the natural conditions in the Tanana country all combine in a higher degree to favor agriculture than any other part of Alaska.

I sometimes think I would like to turn farmer myself for a year or two to convince the public that even in Alaska farming and grazing can be successfully conducted.

Respectfully,

J. LINDLEY GREEN.

Prof. C. C. GEORGESON, *Sitka, Alaska.*

FARMING OPERATIONS OF MESSRS. NICOLAI AND CLARK.

Two Wisconsin farmers, Messrs. H. E. Nicolai and D. H. Clark, have formed a copartnership and begun farming operations at Dyea and Skagway. Work was begun in the summer of 1900, when some of the land was cleared, some vegetables were grown for the local markets, and some grain was raised for hay. Both at Skagway and Dyea is a limited amount of level river-bottom land of a quality well suited for farming and gardening. Of these two tracts they have secured 40 acres at Skagway and 120 acres at Dyea. The land is a sandy loam which can be easily worked, and for the present, until it becomes exhausted, it is a rich soil, producing large crops of various kinds, and they have made extensive preparations to increase this acreage next year. They have built a propagating house and hot-

FIG. 1.—ALASKA STATIONS—FARMHOUSE OF MESSRS. NICOLAI AND CLARK, DYEA.

FIG. 2.—ALASKA STATIONS—POTATO FIELD OF MESSRS. NICOLAI AND CLARK, DYEA.

beds in which to raise plants of such crops as are to be transplanted. They have barns, root cellars, dwelling houses, and they have equipped their farms with work animals and implements. Their work has so far necessarily been of an experimental character, inasmuch as they had to feel their way not only in regard to the crops which can be successfully grown there but also as regards the requirements of the market. They have thus tested all the common, hardy vegetables, potatoes, cabbages, cauliflower, root crops of various kinds, carrots, and parsnips, peas, etc., and with scarcely an exception all these crops have been grown with marked success. This year they planted 24 acres to potatoes and set out 35,000 cabbage plants. These two were their leading crops, but they also had several acres of turnips, ruta-bagas, radishes, lettuce, and such crops as are usually handled by grocers. They have, both last year and this year, raised considerable fields of barley, oats, and wheat. These grains, however, have been grown for hay and not for the sake of the grain. Hay is worth $30 a ton, and it consequently pays better to harvest the crops before they mature than to allow the grain to ripen. Oats and barley have, however, ripened on the Dyea farm both last year and this year. I visited their farms at Skagway and Dyea early in September of the present year, and I must say that their crops were gratifying to behold. I have never seen finer cabbages, or vegetables of similar kinds anywhere which could equal theirs in quality. It is by this time an acknowledged fact that vegetables grown in Alaska are far superior in quality to similar vegetables produced in the States. For crispness and richness of flavor Alaska vegetables are unequaled. This is acknowledged by the merchants, and local produce consequently commands a higher price than the same articles shipped up from Puget Sound.

A portion of the ground which they have under cultivation is yet too new to produce the best results. Certain tracts on the Dyea farm are so low as to be flooded by occasional excessively high tides, but on the whole these two gentlemen are much pleased with the results of their efforts, and they have planned extensive improvements in the near future. They are energetic and practical men, who thoroughly understand their business, and now that it has been proved what the soil and climate will produce, there can be no doubt as to their success in the future. Mr. Nicolai has kindly consented to write an account of their operations, which it gives me pleasure to present herewith.

Pl. XX, fig. 1, shows the farmhouse of Nicolai and Clark on their Dyea farm, and Pl. XX, fig. 2, is a view in one of their potato fields at Dyea. Incidentally it shows also the kind of land they are working with. Most of it was covered with timber or stumps, which had to be cleared away. A portion of the present crop of potatoes is grown among the dead timber.

SKAGWAY, ALASKA, *October 1, 1901.*

MY DEAR SIR: According to my promise, I will give a condensed report of our work in the agricultural line here and at Dyea for this season.

Our work commenced about the middle of March in the greenhouse. The first cabbage and cauliflower seed was then sown, and the last was sown about April 1. We commenced transferring the first plants to the hotbeds about April 20.

The first cabbage plants were set in the open field May 12, and the last ones about June 15. The varieties planted were Early Jersey Wakefield, Flat Parisian, Curries Eclipse, and Early Summer. All headed well, and the first two varieties were ready for market about July 20. Some of the last two varieties named were ready for market a month later, and all made good, solid heads by September 20, some of which weighed 15 pounds.

We set out 35,000 plants, and in my experience of twenty-five years as a truck farmer in southeastern Wisconsin I never had a more perfect crop of cabbages. The quality is first class, which can be said of all vegetables raised in this section. The yield was about 15 tons per acre, and the price from 2 cents to 4 cents per pound.

The land on which the above crop was raised is of alluvial formation and was covered with a dense forest of cottonwood and spruce until two years ago. Part of it was broken up a year ago last spring and cropped last year; the balance was broken up last April, and all of it was fertilized with fresh cow manure during the fall and winter. The land which was tilled a year ago produced a heavier crop, and the heads were much more uniform in size.

Our last plants were set on ground on which we had already raised a crop of radishes, lettuce, and set onions. The radish and lettuce seed were sown April 20, and the onion sets were put out about the same time. They were marketed between the 1st and 20th of June. This particular part of the cabbage field spoken of is shown in the foreground on the photograph containing the two ladies and a gentleman in the center of the field (Pl. XXI).

I need not dwell long on our experience in raising rhubarb; the photograph will speak for itself. We sowed the seed a year ago last April, and transplanted the roots last May; the result is shown in Pl. XXII.

Ruta-bagas, turnips, radishes, and lettuce need scarcely be mentioned here, as they grow as luxuriantly here as weeds do in Wisconsin; all that is necessary is to scatter the seed. We sowed turnip seed as late as June 20 and got a good crop, but ruta-baga seed should be sown in the spring to insure a large crop. We had some weighing over 15 pounds.

We have not been able to raise large onions from seed as yet, but have had very good success in raising them for bunching. For this purpose we had them as large as 1½ inches in diameter.

Radishes, lettuce, and green onions can be had fresh from the garden here from June 10 to October 1 by sowing the seed at intervals during the summer.

Our table beets made a fine growth this year. They were ready for bunching for greens June 20, and by the last of July they had attained a size of 3 or 4 inches in diameter—just a good market size.

Other vegetables that we have experimented successfully with are carrots, parsnips, salsify, parsley, celery, kale, kohl-rabi, spinach, and cauliflower. The last mentioned is the finest in flavor of any I have grown.

The above finishes the report so far as our work in the vegetable line is concerned, but I feel it would be an injustice to Skagway if I did not mention the wonderful growth and beauty of our flowers.

The photograph showing the greenhouse, with Mr. and Mrs. Clark seated on the edge of the hotbed, has a cluster of dahlias and nasturtiums in the foreground, which commenced to bloom about July 10 and are still blooming. The dahlias are exceptionally fine, being very large and perfect in form. The poppies commenced

ALASKA STATIONS—VIEW OF A PORTION OF THE CABBAGE FIELD BELONGING TO MESSRS. NICOLAI AND CLARK, SKAGWAY.

ALASKA STATIONS—A FIELD OF RHUBARB BELONGING TO MESSRS. NICOLAI AND CLARK, SKAGWAY.

ALASKA STATIONS—PROPAGATING HOUSE AND LUXURIANT GROWTH OF FLOWERS, GARDEN OF MESSRS. NICOLAI AND CLARK, SKAGWAY.

to bloom about the same time and have continued in full bloom ever since (Pl. XXIII).

The sweet peas, which are shown in the photograph at the base of the greenhouse and at the right of Mrs. Clark, have been in bloom the greater part of the season and will continue until frost comes.

Mrs. Bigger, at Dyea, had pansies in bloom the first week in May, which had been in the open ground all winter, and are in full bloom yet. Pansies do exceptionally well here, but nearly all ordinary flowers do well, roses included.

EXPERIMENTS AT DYEA.

The land at Dyea is similar to that of Skagway, only a little more sandy and somewhat drier, so that we shall be compelled to irrigate some for certain crops.

I commenced operations at Dyea May 6, with three men and three horses. In explanation I will mention that there had been no preparation made for farming previous to this time, except that there had been a few acres of tide land broken up the year before and sown to grain, which was cut for hay, and about 5 acres in an old slashing where the rotten logs had been picked to pieces and piled. I will also mention that I met with new conditions here in the line of farming, which require new methods of treatment.

On May 10 we planted our first potatoes, 1½ acres of Early Ohio, and on May 15 we planted 4½ acres more of the same variety. May 18 we planted 2 acres of the Early York variety, and another acre of the same variety May 21. These were all planted on what might be classed as semitide lands. Most of this land was covered by débris that was deposited there during extraordinarily high tides. The results from this land were not satisfactory so far as our potato crop was concerned. The land is so salty that 4 acres of the potatoes did not come up at all, and while the balance came up quite strong, they made a weak growth after they got about 3 inches high. I think the dry weather was mainly the cause of the weak growth, there being no rain to speak of during the months of May, June, and July, but I am also satisfied that there is too much salt in this soil for potatoes to do well.

We commenced using potatoes from the field July 28, and by August 15 they were dry and mealy, but rather small, although there were quite a good many potatoes that weighed half a pound each. Some of the vines began to turn yellow by August 1, but at that time our rains commenced and they started a new growth which was more of a damage than a benefit at that stage of the crop.

We commenced harvesting the crop September 18. There were about 5½ acres left after deducting the ground that was too salty to grow anything. They yielded 480 bushels and were of fair quality, though rather small and containing a few rotten ones.

On the same kind of land as already described, on May 16, we sowed 2 acres of oats mixed with field peas and 2 acres of wheat. The wheat proved to be fall wheat, so it did not head. It made a slow growth all summer and is now a perfect mat, covering the ground completely, but there is some danger of its being winterkilled on account of its exposed location. The oats made a fine growth, attaining a height of 4 feet. The berry was large and heavy, and it commenced to ripen during the last of August, but was cut for hay.

Our next experiment was on 3½ acres that had a very heavy growth of flower-de-luce on it; also some small spruce trees, which we grubbed out. After thoroughly fitting the piece we planted it on May 24 to three varieties of potatoes, viz, Early Ohio, Early York, and Milwaukee. The Milwaukee had been chilled before they left Wisconsin, so that there were only about half that grew. All made a weak growth at first on this piece, owing to the tough sod, but improved as the season advanced. There was plenty of subirrigation in this piece, and it was the only piece

that did not suffer from the drought this season. These are being harvested at this writing, and are of fair size and good quality, being well ripened and yielding about 100 bushels per acre.

The next piece consisted of 3½ acres of similar land; that is, the surface conditions were the same as on the previous piece, but the soil was much heavier and had a tendency to "bake" after it was plowed. Two acres of this piece were planted to Early Ohio potatoes on May 30, and the balance sowed to barley the same day. Both barley and potatoes came up weak and spindling. The potatoes were harvested September 28. They were rather small, but thoroughly ripe and of good quality, and yielded 100 bushels from the 2 acres.

The barley was eaten off about the middle of July by horses that broke into the lot, which proved to be a benefit to the crop. When the rains commenced in the fore part of August the barley started a new growth, so that by September 24 we cut it for hay. It was about 2½ feet high, well headed out, and the berry was fairly well filled. The straw was juicy and hard to cure.

Our next attempt was to clear up an old slashing where the greater part of the timber was cut off in 1897 and 1898. The fire had swept through it and killed the remaining trees, some of which had already tumbled over. We commenced work on this piece May 31. It was a great undertaking to put in a crop that late in the season under these circumstances; but by June 15, we had 8 acres planted and June 20 we did our last seeding. It consisted of 2 acres of turnips, one-half acre ruta-bagas, and 1½ acres of barley. The varieties of potatoes planted in this place were Early Ohio, Early York, and Milwaukee. The Milwaukee did not get quite ripe on this piece, but were of good market size and of good quality. The Early Ohio and Early York were about ripe, as the vines were quite yellow October 1. The last planting, June 15, made the most vigorous growth of vines and had also the finest tubers. We have only dug a few in this piece, but the estimated yield is 1,000 bushels. The quality is first class and the potatoes are of good market size. Some very large. If the space that is occupied by the stumps was deducted from the 8 acres, they would easily go 150 bushels to the acre. The turnips made a fine growth. We commenced pulling them for market September 6 and have plenty of them on hand yet. The ruta-bagas are small, although there are some of marketable size. They should be sown earlier in order to insure a full crop. The barley did exceptionally well, being 4 feet high, well headed, and in blossom when we cut it for hay, September 24.

On August 20 we seeded 2 acres of this same kind of land to fall wheat and 2 acres to rye, and seeded all 4 acres to timothy and alsike clover, all of which has made a vigorous growth. I have just completed an irrigating ditch to cover this tract of 16 acres, so that we shall be in better shape next year to raise a crop, if the season happens to be dry again. We seeded about 20 acres of this old slashing to timothy and clover a year ago last May, or, in other words, we scattered the seed among the logs and brush; the result is a fine stand of tame grass.

FRUIT.

I brought 30 fruit trees with me from Wisconsin last April, consisting of the following kinds: Twelve apple trees, 12 plum trees, and 6 Early Richmond cherry trees. The apple trees consisted of 6 Duchess of Oldenburg and 6 Transparent, and the plums of the Wild Goose and Wolf. They were shipped to me in Wisconsin in December, and from there forwarded to Skagway in April, and were in very poor condition on their arrival here. The result is that only 17 out of 30 lived. The Duchess are all alive, having made a healthy growth, and ripened their wood in August. Of the Transparents 4 lived, made a fair growth, and ripened their wood. The Wild Goose are all alive and made an enormous growth, but the wood is not ripened off at this writing. Most of the Wolf were virtually dead before they left the nursery, but one of them lived and made a good growth. The cherry trees from the nursery all died,

but I had also brought 6 little cherry trees from my home in Wisconsin, which made a healthy growth and ripened off the wood in August.

I set out about 200 strawberry plants on May 20. It was between life and death with them until August 1, when we had a good rain. Since then they have made a vigorous growth, until now they are the finest plants I ever raised, though I have been a grower of them the past twenty-five years. In conclusion, allow me to say that I am well pleased with our summer's experiment, and shall try to double our efforts during the coming year.

It would be hardly fair to close this report without mentioning my neighbors' success. Mr. William Workman has 6 acres of potatoes and about 12 acres of grain. The oats and barley were ripe by the middle of September, and though the wheat was green it made excellent hay. The whole was on land plowed last fall, and made a heavy growth. His potatoes were mostly Burbanks, and yielded about 200 bushels per acre, being on old ground, some of which had been manured. Mr. L. Wilson had about one-fourth of an acre of Burbank potatoes which yielded at the rate of 300 bushels per acre. They were large and of good quality. The ground had been well manured before planting.

There is but one drawback to the development of agriculture in this section of Alaska, and that is the want of title to our land and the meager amount of land allowed to a squatter. I can see no valid reason why the general land laws of the United States could not be extended to Alaska, or such portions of them as would give us a chance to acquire title to our holding, and not be continually at the mercy of the claim jumper.

H. E. Nicolai,
Dyea, Alaska.

Prof. C. C. Georgeson,
Special Agent in Charge of Alaska Investigations, Sitka, Alaska.

PRIVATE GARDENS AT SKAGWAY.

Being compelled to wait in Skagway for a boat for two days in the early part of September, I improved the opportunity to look over the private gardens in the town. I found them to be not only numerous, but excellent. There were in Skagway the past season not less than 50 private gardens, none of them very large, but most of them large enough to supply vegetables to the respective families. Potatoes were the leading crop, followed closely by cabbage, cauliflower, turnips, lettuce, radishes, carrots, and parsnips. In some cases cucumbers were also grown successfully. Flowers were also well represented. There was scarcely a dooryard in which could not be found a fine collection of the hardy annual flowers. Pansies and sweet peas seemed to be the favorites, but poppies, nasturtiums, mignonette, marigolds, larkspur and a dozen other annuals were also much in evidence. The remarkable feature was not that the residents should attempt to grow these things, but rather the extraordinary luxuriance of everything. I have seen no finer pansies and sweet peas anywhere than could be found in some of these Skagway dooryards. Fine patches of lawn could also be seen here and there. A splendid sod of close-shaven grass presented a carpet of green which could not be surpassed. Patches of red clover could be seen here and there 2 feet

high and timothy 3 feet high. All of which proves that gardening is possible in Skagway.

The following clipping was taken from the Daily Alaskan, published at Skagway, July 24, 1901. It indicates that the community is supplied with native-grown products:

LETTUCE.

For the first time in the history of Skagway native-grown lettuce and radishes are a drug on the market. There are so many good gardens this year that the novelty of home produce has ceased.

Nearly every householder has at least a small bed of lettuce and radishes, and they grow so luxuriantly and with such little care that those who have planted these succulent vegetables have a surplus to donate to their neighbors. Green peas, fresh from the gardens of Skagway, are now plentiful in the market, and young onions have been pulled daily for the past month. Anyone who is skeptical about the adaptability of Alaska for gardening need only to take a walk about the city and see the rank growth of vegetables in the kitchen gardens to gain full faith not only in the fertility of the soil, but in the adaptability of the climate for growth and maturing of the hardier varieties of vegetables.

GARDENING ON THE PORCUPINE.

The Porcupine has, since the discovery of gold, had a considerable influx of miners and prospectors. It may be explained that the Porcupine here referred to is not the Porcupine of the North which empties into the Yukon and Fort Yukon, but the region north of Haines Mission, including the territory claimed by the Canadians, and which takes its name from Porcupine Creek. The accompanying illustration (Pl. XXIV) shows in a graphic way what is being done in the line of gardening in that region. The photographs from which both plates have been reproduced have been furnished by Mr. F. F. Clarke, and they represent a view of his garden and some of his vegetables. The cabbages were planted out in the latter part of May and the photographs were taken near the middle of September, consequently the growing season would be extended by nearly another month before killing frosts would occur. The products are highly creditable not only to the grower, but to the region. Mr. Clarke furnishes the following information in regard to his garden. He states that he will have about 6 tons of strap leaf turnips, about 25 tons of ruta-bagas, and 1,200 head of cabbage, and that he raised oat hay 6 feet tall. All of these facts are of interest and speak well for the possibilities of Alaska.

LETTERS FROM SETTLERS.

I submit herewith a number of letters received from settlers in nearly all parts of the Territory. They relate for the most part to the experience of the writers with the seeds which have been sent them from the agricultural experiment station. It will be noticed that all

ALASKA STATIONS—FIELD OF CABBAGE, PORCUPINE, 1901, GROWN BY F. F. CLARKE.

are of the same tenor. Wherever the soil was in proper condition and the crops received the necessary amount of attention the results have been very satisfactory. There is no longer any doubt in regard to the possibilities of gardening in Alaska, in the interior as well as on the coast, though it is true that the experiments in the interior are as yet somewhat limited, but as a rule success has attended proper efforts.

A feature of some of these letters which merits more than passing attention is the fact that the Indians have in many instances been induced to raise gardens by the example and assistance of the white settlers in their neighborhoods. This is an encouraging feature. It fosters the hope that if the Indians could be taught how to raise the most common hardy vegetables they would in many cases do so with great benefit to themselves. The theory that the Indians will not eat vegetable food; that they mostly, and always will, live on meat and seal oil or starve has no foundation in fact. The natives will make use of any food material, though perhaps they have a preference for that which comes handy and can be obtained with the least exertion.

MUCH PLEASED WITH HER GARDEN.

SITKA, ALASKA, *October 28, 1901.*

DEAR SIR: We wish to thank you for the garden seeds furnished, and would like to report our great success.

Our garden is situated where it gets the sunshine all day. It has been well worked for four or five years. No fertilizer was used this year at all. It consists of a plat of ground 30 by 80 feet.

We commenced making our beds the 27th of April and planted lettuce and radishes. The spring was cool and the seeds were a little slow in germinating, but grew rapidly as soon as the warm days came. We continued to plant these during the summer, and still have both lettuce and radishes in abundance. Our peas were sweet and the pods well filled; turnips large and sweet, and cauliflower did remarkably well, many of the heads measuring 12 inches in diameter. The beets were exceedingly fine and grew to be quite large. We planted onion seeds, but it was a little late; but we have had an abundance of green onions all summer. Carrots, kale, and rutabagas did well, and are as fully grown as I have seen farther south. The cabbage have large, firm heads, free from worms, the pests of our neighbors farther south. At this date we have just commenced to use our parsnips; many of them over 14 inches in length, and as tender as any we have ever cooked.

We also raised two varieties of beans, which did well, ripening the 1st of September. From nine hills of potatoes we had enough to supply a family of three a month.

We have had several rows of celery, which has headed out well, and it is firm and crisp.

Strawberries did very well, and from two small rows we had enough for our family for about two weeks. We had a few raspberry bushes, from which we gathered each day enough for dessert for six weeks and also put up several jars of jam. From two or three gooseberry bushes we secured plenty of gooseberries for sauce for two weeks. We have also a few bushes of the red and white currants, which yielded an abundance of currants for table use for six weeks and over 20 pints of the most delicious jelly we ever tasted. It is a good rich color, well flavored, and solid.

We have raised from the seed six dozen asparagus plants and set them out. They

are about 6 inches high and very thrifty. This is merely an experiment, as Sitka has not an asparagus bed, but we have no doubt of its ultimate success.

Our rhubarb has been exceedingly productive and does well here. We also have parsley and an abundance of horse-radish.

There is no reason why the people of Alaska should not raise all of these vegetables, as they can be as successful here as in Oregon or Washington, and lettuce and radishes much better. Owing to the cool summers and frequent rains, vegetables do not dry out, or become pithy, and can be kept in excellent order from June till November.

Thanking you again for the seeds, I am, sincerely, yours,

Mrs. George Stowell.

Prof. C. C. Georgeson, *Sitka, Alaska.*

GOOD GARDENS AT WRANGELL.

Wrangell, Alaska, *November 1, 1901.*

Dear Sir: Last spring you were so kind as to send me some seeds, and I now wish to tell you what I think of agriculture in southeastern Alaska.

The season has been an exceptionally wet and cool one here, so I am told, and yet I have fairly good results from my garden, although I think it could have been more satisfactory had the ground been properly fertilized, as it has been in use for years, and while crop after crop has been taken from it nothing has been given back in return.

On the 18th day of June I planted peas, radishes, turnips, lettuce, carrots, and a few beans. All except the latter came on and did splendidly. From three short rows of peas we enjoyed several good messes in a large family. The radishes came on very rapidly, and had an excellent flavor and were brittle and palatable for weeks after the first came into use.

The turnips surprised everybody, they grew so rapidly and were of such fine flavor.

Within four weeks after planting we had heads of lettuce that would have done honor to any country. The turnips grew rapidly and were sweet and juicy, though when about as large around as an ordinary tea saucer they cracked open, but this did not injure them for table use.

Potatoes that I planted did only moderately well, though those put on the market here from a neighboring garden were large, well matured, and of fine flavor, some weighing 3 and 3½ pounds.

The most peculiar thing is regarding cabbage. The plants grew to a height of 18 inches and 2 feet without a sign of heading, and just when we thought of cutting them for greens begun to head, and inside of three weeks we had cabbage weighing 6 and 8 pounds and of a quality second to none.

So after watching the growth of vegetables, I am well satisfied that everything except beans, tomatoes, and cucumbers can be as successfully grown here as anywhere if proper attention is given to fertilizing and draining the ground. The soil being of a moist and chilly nature, this is very essential, as it would be on soil of a like nature in any section of the country.

I thank you most heartily for a copy of your fourth report, which I have lately received and perused with much interest. It seems to me that this report should be widely circulated, to correct the prevailing idea throughout the outside world that Alaska is a country of perpetual ice and snow; that no good can possibly come of it.

Yours, very respectfully,

A. V. R. Snyder,
Deputy Collector Customs.

Prof. C. C. Georgeson, *Sitka, Alaska.*

GOOD RESULTS AT KASSAN.

KASSAN, PRINCE OF WALES ISLAND, ALASKA,
November 1, 1901.

DEAR SIR: The seeds you so kindly sent me were duly received this spring. I planted some myself, and I gave the balance to the Indians here, as requested by you. The Indians here are the Hydahs, and all of them raise good gardens every year. As for myself, I have lived here for the past seventeen years, and I have tried a garden every year. The seeds you sent me were all good and every one came up. The carrots were fine and did well—I got 9 sacks of them; while peas, parsnips, and radishes also did well. Onions and my potatoes did not do so well. The ground I planted them on was new, and I did not expect so much this year, but will have enough for my family this winter. Next spring I shall plant a big garden.

The kale you sent me I planted in my new ground, and you never saw stuff grow as it did; we had several messes of it and gave away lots, and still there is kale left now 15 inches high.

I want to set out some blackberries, currants, and gooseberries. Can you inform me where I shall be able to get the roots? I also want some pie plant.

I inclose the names of the Indians I gave the seeds to. I have shown them how to plant them and take care of them.

I was born on a farm in Illinois and know a little about it, and as long as I live I shall try and raise a garden of some kind.

Yours, truly, W. T. BERNARD.

Prof. C. C. GEORGESON, *Sitka, Alaska.*

GOOD RETURNS FOR LABOR.

LORING, ALASKA, *September 2, 1901.*

DEAR SIR: I desire to say with reference to seeds sent from your station, that it was quite late before I received and planted them. We had a very wet August, but my garden was very good, especially onions, radishes, lettuce, peas, and ruta-bagas. I spaded it up, and cultivated with a hoe, and fertilized with manure from cow stable. We still have plenty of rhubarb, etc.

I have no doubt alfalfa and other grass seed would do well here, and hope to try them next year. I would like to have some of your Pomanow spring wheat. I am the only person at this place that has planted a garden.

I can not give amount of onions, radishes, etc., raised an acre, as I was too busy otherwise to take any measurements. The soil gave good returns for all my labor, and I shall expect to do better another year.

Respectfully, yours, F. KNIGHT.

Prof. C. C. GEORGESON, *Sitka, Alaska.*

REPORT FROM SUMDUM.

SUMDUM, ALASKA, *April 20, 1901.*

DEAR SIR: As the season is about closed I send you my report. All of the new ground we put in this year has been a failure. The old ground has done fairly well. We raised some ruta-bagas which went as high as 7 pounds, and some white turnips are 11 inches in diameter. Cauliflower and cabbage have done well, but the onions have gone too much to tops.

I have tried some tame strawberries; they had some fruit this year of fair size. Is

there any way to kill worms? I tried some tobacco, but it did not get big. I will try again.

Where can I get a copy of land laws?

C. F. STITES.

Prof. C. C. GEORGESON,
Special Agent, Sitka, Alaska.

REPORT FROM DYEA.

DYEA, ALASKA, *November 14, 1901.*

DEAR SIR: Your letter of the 2d instant received a few days ago, and I take great pleasure in answering it. I only wish I had more to tell you, but to tell the truth, my lack of implements necessitated some rather crude methods.

My idea at first in putting in my crop was simply to raise feed for chickens, as I meant this for a chicken ranch. I used no fertilizer, simply burning off the brush, and was astonished at my own success.

The wheat and oats were fully ripened before I cut them. I think I was most pleased with the wheat; the heads were full, and it was so heavy that I was unable to use a cradle. I intend next year to put in a larger crop, and feel confident that it will more than repay me.

Alaska has a grand future before her, I feel confident, and I am planning to make my home here for years to come. I have had my ranch platted, and intend to plant a crop on it in the spring.

Sincerely, yours,

L. ROSS STACY.

Prof. C. C. GEORGESON, *Sitka, Alaska.*

A FINLANDER'S EXPERIENCE.

SEWARD CITY, ALASKA, *October 8, 1901.*

DEAR SIR: This spring was later than the year before. I planted potatoes from the 19th to the 25th of May. They did fairly well and are fine potatoes. Two years ago I planted potatoes on the 14th of May and had new potatoes July 8.

The ground I have been gardening on covers very nearly one acre and a half. One patch of ground is in potatoes for the third season, and did better this summer than before, and has never been manured at all. The soil is very rich, about 2 feet deep, and I think it will produce crops for many years to come without being manured. I am going to break some more ground this fall. I think it is wise to let the ground lie broken over winter. It has been tried in Finland, the country where I came from, and it seems to do the soil good. The climate over there is very nearly the same as here. I think one could raise almost any kind of vegetable here, if one had a hothouse to start the seeds in and then transplant them when the soil gets warm enough.

Potatoes grow to a pretty good size here. Some weighed a pound and a quarter. They are the finest eating potatoes I have ever had anywhere. They are far better than the potatoes brought up from the States. This can be seen from the difference in prices. Last year in Juneau the potatoes which were raised in Alaska sold for 4 cents a pound, and potatoes brought up from the States sold for 2 cents a pound.

People used to doubt if potatoes raised in Alaska would stand the winter well, but

I can say from experience that they can stand the winter far better than the potatoes that come from the States. They are in a better condition in the spring. During the winter they are just like new potatoes from the ground all winter.

I will be very much obliged to you if you will send me some more seeds. I would like to try them next spring.

Yours, truly,

FRED HANNILA.

Prof. C. C. GEORGESON,
U. S. Department of Agriculture.

SUCCEEDS IN SPITE OF ADVERSE CIRCUMSTANCES.

HOONAH, ALASKA, *October 8, 1901.*

DEAR SIR: In making report of my garden this year there are two factors tending to make my report worthless. The first is the deep snow of the preceding winter, and the second is the fact of my absence from Hoonah from July 9 to September 4. Gardens don't grow without care, and much of mine was hoed only once, and was never thinned.

Owing to the great snow—it was 20 feet deep against our house—our garden was late in being planted. My first was planted May 7, on the south of a building and with snow only a few feet distant. This produced fine lettuce, peas, wax beans, beets, and radishes. Rhubarb seeds also produced good plants. This ground had been fertilized with chicken manure and partly with ashes. It had never been planted before. Some of the beets were transplanted and did equally well.

On May 20 I dug my first parsnips of the preceding year, which had been sealed up by snow and frost during the winter. They were a good size and excellent in quality.

During the same week I planted more garden, also some flowers. This gave some nice cabbage and beets. Horehound and sage did fairly well. Celery and asparagus failed to appear, even after planting a second time. Parsley did well.

Of the flowers planted nasturtiums seem to own the country; they grow so luxuriantly. Poppies and marigolds—the latter from seeds 5 years old—gave excellent results. Mignonette and sunflowers did well. The latter have seed disks fully 6 inches in diameter, but I don't think the seeds will mature. Pansies from the seeds produced some of the finest flowers possible.

I sowed the clover seed partly on ground dug for the purpose and partly among other grass. The first has done nicely. Only a little of the other came up, as the season was dry.

My last planting was June 12—carrots, parsnips, beets, potatoes. Were not thinned, and hoed only once, so of course they are small. But I have learned that potatoes will do as well if only the skins are planted as the large pieces.

Some of the seeds were secured from Peter Henderson, but I am unable to say which varieties gave the best results. When we came here we brought a variety of peas with us in a package labeled "Klondike Seeds," which we consider a much better producer than the variety you sent. We have forgotten the name but wish we could secure it again. It grew taller and was much lighter in color than this.

Many of the natives planted seeds that you sent, but I don't know the results.

Hoping to be able next year to write more accurately, and thanking you for past favors, I am,

Sincerely, yours,

(Rev.) WM. M. CARLE.

Prof. C. C. GEORGESON, *Sitka, Alaska.*

REPORT FROM HOONAH.

HOONAH, ALASKA, *October 18, 1901.*

DEAR SIR: I have lived at Hoonah since the year of 1884, and have raised vegetables very successfully, making garden nearly every summer. Radishes, lettuce, beets, turnips, carrots, peas, potatoes, cabbage, and cauliflower do well.

The ordinary garden flowers do well also. I planted all the seeds you kindly sent me this summer, and nearly all came up and bloomed well, although it was a very dry summer. I planted the following seeds the last of May: Sweet alyssum, mignonette, marigold, zinnia, poppies, chrysanthemum, nasturtiums, collinsia, candytuft, sunflowers. Pansies come up from year to year. My flowers are still in bloom at this date. I wish I could bring them all in the house instead of letting the frost take them.

The U. S. S. *Gedney* was in our bay nearly all summer. I kept their table pretty well supplied with vegetables and flowers.

My flower garden was admired by every one; even the Indians would stop to gaze upon it as they passed along.

I hope you will cheer me again with some seeds next summer.

With thanks for past favors,

Yours, very respectfully,

Mrs. J. W. MCFARLAND.

Prof. C. C. GEORGESON, *Sitka, Alaska.*

EXPERIMENTS AT KODIAK BAPTIST ORPHANAGE.

WOOD ISLAND, KODIAK, ALASKA, *September 25, 1901.*

As requested in your favor accompanying the seeds sent last spring, I herewith submit report of what has been accomplished with the same.

Asparagus was sown in open ground, very rich, April 27 and in cold frame April 29. Again in open ground in May. All sowings did well, but the plants in cold frame are much the best. They are a foot or more high at this writing.

Wax beans, no good.

Beets, few seeds germinated, and most plants throw up seed stock as soon as a few leaves are set.

Carrots, sown April 29 and May 7. Seed very slow in germinating; on old, rich land plants that finally appeared made large roots. Seed on rich, new soil sprouted better, but roots are small.

Cabbage, sown in cold frame April 29. Few plants are headed. Cabbage sown in boxes in the house and transplanted into cans, and then into garden, have made the best heads I have ever raised here. Some heads will weigh 6 pounds.

Cauliflower, same result as cabbage. Many plants now have a large amount of foliage, but no heads. A few have made excellent heads.

Celery from seed was worthless. Some plants secured from the A. C. Co. are making excellent showing.

Cucumbers were sown in a cold frame, and plants grew well but amounted to nothing.

Kale flourishes exceedingly well, and produces a large number of tender leaves.

Lettuce is one of the best and easiest to raise of all the vegetables. Sown in open ground April 27 and in cold frame April 29, it has kept us supplied with large, tender heads all summer. Some heads are more than a foot in diameter, and the centers have been almost as solid as cabbage for a diameter of 3 inches. The leaves do not get tough and bitter as they do in the States.

Mustard was sown May 7, and grew well, and matured seed.

Onions from seed have always been a failure here.

Parsnips, same result as with carrots.

Parsley was sown in a cold frame from April 29. It has made little progress. The seed germinated, but the leaves are small and the amount small.

Peas were planted April 27 in open ground, and have done well all summer. Seed has matured in addition to furnishing green peas for table use. Blossoms are on the vines now.

Radishes have never given trouble. They grow well and to large size. They retain their tenderness and freshness well.

Rhubarb was not planted, as we have a large number of roots, most of which have been raised from seed the past few years. Some of the stalks will measure 4 inches in circumference.

Spinach has always been a failure here. Seed stalks are sent up almost as soon as the plants are through the ground. I had two or three plants that were in good form for greens this summer.

Turnips always do well. We gathered some that weighed 2½ pounds, and were smooth and tender.

Ruta-bagas have not done so well as turnips. The tops are very large, and they would make good forage, but roots are small.

The clovers were sown early in May, and some of the seed germinated. There are some plants now to be seen, but the stand is not good, nor do the plants look flourishing. White clover sown several years ago in our front yard is doing nicely and spreading rapidly, notwithstanding the constant tramping of the children.

Romanow spring wheat, Manshury barley, and Finnish Black oats were sown in the garden May 7, and all made a heavy growth. Some stalks of oats and barley stood 6 feet high, and the wheat was little less in height. The barley has been cut, and the yield was excellent. On 210 square feet there were 9¼ pounds of grain, which is at the rate of 40 bushels per acre.

The oats and wheat are not matured at this date, but may mature sufficiently to make seed before heavy frosts come.

Other patches of each were sown, May 29, 30, and June 1. The growth has in all cases been good, even on new soil, but none will mature except possibly a small patch of barley, which is now turning yellow. The grain could have been sown early in April had it been here, and in that case all would have stood a favorable chance of maturing.

I received a good-sized shipment of garden and farm seeds from a well-known seed company in the States, and it may interest you to know the result of planting that. As the seed did not reach here until June 10, the chances were against success, but some kinds did well.

A barrel of potatoes, consisting of Salzer Sunlight, Earliest, All the Year Round, Daughter of Early Rose, Sir Raleigh, arrived in bad condition, from being so long on the road, owing to a mistake on my part, but have proved that they are all good seed for Alaska. The yield is good and the tubers large and smooth.

Some sand vetch was tried on a sand field near the beach and is worthless.

Earliest Russian millet amounts to nothing, although tried in various localities.

Giant spurry made a good growth on good soil, but on sand did nothing.

Timothy could not be expected to do better on old or new ground.

Dwarf Victoria rape on good soil has made a good yield of forage.

Cow and hog peas in favorable places have done fairly well.

Spelt was planted on sand and on new soil. On the first it grew 14–24 inches high and was well headed, but the stand was light. On new soil the stand was better, the straw good, and the heads larger. Neither had time to mature.

I secured also some shrubs and trees as follows:

A crab apple which has made a fair growth this summer; an apple, which is

vigorous and healthy now; a plum which sent up a shoot from the root, the top being dead, but the shoot was accidently broken off; a lilac, which is now a healthy plant; two peonies, which are doing well, and a Chinese wisteria which has made the best growth of all.

The flower seeds you sent were highly appreciated, and we have had several beds of blossoms for weeks from them.

Wishing you continuation of success in your work, I am, yours sincerely,

CURTIS P. COE.

Prof. C. C. GEORGESON,
Special Agent in Charge of Alaska Investigations.

REPORT FROM KADIAK.

KADIAK, ALASKA, *September 26, 1901.*

DEAR SIR: I wish to inform you that the seeds I received from you here turned out very well, except the cucumbers, which failed, and the onions did not get very large. The asparagus took a long time to germinate. I followed your directions in planting the seeds. The ground is a black soil, and this year I used barnyard manure, which I find very effective.

Last spring was cold and late; I did not plant my garden until the 7th of June. We have, however, had splendid weather the last month, and it still continues. The gardens are doing wonderfully well.

Yours, respectfully,

ANTON LARSEN.

Prof. C. C. GEORGESON, *Sitka, Alaska.*

GRAIN RIPENED AT HOPE CITY.

HOPE CITY, COOK INLET, *October 20, 1901.*

DEAR SIR: I have experimented with most of the seed you sent to me, and have had fair success with everything I planted. I will send you a sample of the wheat, oats, and barley, as it grew; sown on May 20, and ready to harvest October 1. Our season was very late here, so consequently we could not say that everything had a fair chance. I will report more fully later.

I have cleared an acre this fall and plowed the same, and hope to surprise you next fall with the samples which I shall send to you at my own expense.

Respectfully, yours,

S. C. COLLINS.

Prof. C. C. GEORGESON, *Sitka, Alaska.*

RIPE GRAIN AND LARGE CAULIFLOWER AT AFOGNAK.

AFOGNAK, ALASKA, *October 13, 1901.*

DEAR SIR: Half of the seeds you sent to me I distributed among the natives, except the barley, and the other half I used myself.

On April 15 I sowed the following seeds in a bed: Cabbage, celery, cauliflower, and kale. Set them out on beds June 4; cabbage and kale are on bed yet and growing. The cabbage is small, but passable. The kale is fine. Celery was a failure, on account of too close planting. The cauliflower is fine. The biggest head of cauliflower weighed 10¼ pounds and measured about 45 inches in circumference.

I sowed some tobacco seeds—"Connecticut Seed Leaf"—in a box. At the begin-

ning of June the plants were 3 inches tall, when I transplanted them in open ground. At the end of September I cut them down (almost 50 plants), and have them now in process of curing. The biggest leaves are 20 inches long without the stems, and the plants 3½ feet tall.

As farmers in Finland grow tobacco successfully for their own consumption, I can not see any reason why we can not do the same in Alaska.

I sowed barley (Manshury) on May 23 on two beds. It commenced to show up June 1, headed July 27, commenced to bloom August 10. October 11, when I harvested it, the straw was still a little green, but the seeds were hard. The straw measured 3½ feet tall.

Buckwheat (Silver Hull) seeded May 23. I raised the seed the previous summer. It came up June 5 and I gathered it October 11; matured only 10 per cent of the seeds formed after blooming.

Planted beans (Broad Windsor) May 23; they were blooming July 27, and blooming still. Plants are 4 feet tall and have pods on them; lower pods are full grown but green.

I sowed the following seeds from May 23 to May 26, besides those mentioned above: Onions (Yellow Danvers), parsley, cauliflower, rhubarb, peas, spinach, cucumber, parsnip, carrots, beets, kale, cabbage, mustard, clovers, sunflowers, caraway, sage, asparagus, lettuce, radish, turnips, ruta-baga, watermelon, and musk melon.

The biggest onion from seed measured 1¼ inches in diameter. The biggest parsnip measured 1¼ inches in diameter. The biggest carrot, 1¾ inches in diameter. The biggest beet, 4 inches in diameter. Asparagus is 6 inches tall at present. I was very successful with these vegetables, considering that the ground had been cultivated only one year.

I gathered a good lot of potatoes. It was a very bad year; the spring was late and very rainy, and the fall cloudy.

Yours, truly,

ALEXANDER FRIEDOLIN.

Prof. C. C. GEORGESON, *Sitka, Alaska.*

EXPERIMENTS AT AFOGNAK.

AFOGNAK, ALASKA, *October 24, 1901.*

SIR: I received a great variety of seed from your station last spring, as well as the spring of 1900, and of these I have given the following trial: Romanow wheat, Manshury barley, Ligowa oats, Riga flax, red, white, and alsike clover. All were sown the 23d of May, in an old potato garden, the soil being a sandy loam, manured with kelp in the fashion it is generally done here for potatoes.

The three kinds of grain were doing surprisingly well up to the 10th of July, when cattle broke into the garden and ate off every straw clear to the ground. They grew up again very fast, however, and to my great astonishment I found the barley heading on July 24; the oats were a week later, and the wheat a few days thereafter; but the growth was stunted, of course, especially so with the barley, the straw of same not being any longer than just before it was eaten off.

On the 13th of October the barley was harvested; height about 2 feet, very even, fine heads, and seed ripe enough to germinate. On the last named date the wheat and oats were yet perfectly green, the former about 4 feet high and the latter 3.

The flax began blooming about July 24, seed nearly ripe October 13, height over 2 feet.

The clover was slow in making a start, but since it was once well up grew very fast, and the latter part of the summer the white and alsike clover looked as fine

as I have seen them anywhere, and I believe that the conditions of this region will agree with these varieties very well; but the red clover is uneven, comparatively short, and looks somewhat dried up, as though the soil was too poor for it.

In connection with my above-mentioned experiments, it must be remembered that last summer was unusually cold and rainy right through, and all planting here was two or three weeks later than ordinary seasons, where no very good results could be expected.

Very respectfully,

HERMAN V. SCHEELE.

Prof. C. C. GEORGESON, *Sitka, Alaska.*

CATTLE DO WELL ON NATIVE FEED.

YAKUTAT, ALASKA, *November 14, 1900.*

DEAR SIR: I received last year at this mission a great many seeds from you. I have made a test of those I thought fit for the country.

I began to plant the seeds in May, and planted as much as I found time to. Some of the seeds did pretty well.

I raised fine cauliflower, cabbage, radishes, peas, lettuce, turnips, etc. Onions grow very small here, but my potatoes were large and ripened so well this year that I think I never saw better ones.

I think yearly more and more of stock raising as a business in Alaska. There are hundreds of places where grass is plentiful, and this coarse grass along the beach gives good satisfaction. It has done so for me for years back.

I keep four or five head of cattle and feed them on silage all winter, and they are all the time in good condition, and the cows give good milk. As Alaska develops there will be a growing demand for beef.

This country will soon come to the front and people will find many ways of making money in this part of Alaska. Here is plenty of fish, of course; but any one who has cattle to sell will surely find a market for them. The beef grown in Alaska is excellent.

A silo can be made very cheaply anywhere where wood is found. I made mine of boards only, and it answers the purpose very well. I do not think anybody in Alaska has better feed for cattle than my silage. I have had now beef here for nearly twelve years, and I can see a great change.

Respectfully,

(Rev.) ALBIAN JOHNSON.

Prof. C. C. GEORGESON, *Sitka, Alaska.*

[The above letter came to me too late for last year's report.—C. C. G.]

NATIVES BEGIN TO RAISE GARDENS—LARGE DEMAND FOR SEED.

KENAI, ALASKA, *September 24, 1900.*

SIR: I will mention at the outset that we have had a very unfavorable summer. Long droughts in the spring (almost two months); cold winds. All this of course reflected upon our planting.

In regard to the cultivation of ground and planting of vegetables among the natives of Cook Inlet, I must say with great pleasure that a big step has been taken forward. Not more than three years back my parishioners, not excluding creoles, did not know how to eat lettuce, cabbage, and radishes, let alone planting any. They planted only potatoes and turnips, and this on a small scale. In some of the settlements, as Saldovia, English Bay, and Knik, there was not a single vegetable garden. At present

things are very different. Gardens have sprung up where there were none; where they were on a small scale, as at Kenai and Tyonek, they increased in dimensions.

The request for seeds is very great. What you have sent last spring was enough only for Kenai, Ninilchik, and Knik, so I was obliged to refuse people from the other four settlements. The natives of Kenai are very fond of turnips. We really need seeds by pounds and not by packages.

It would be positively a great kindness if the Government, once for all, would send some seed potatoes for some of our natives. They are very anxious to raise some potatoes, and thereby improve their material condition, but they have no seed and no money to buy any with. In this connection the Government would render the natives here a very great service, and by this better their condition and accustom them to the cultivation of vegetables. We hope, my dear Professor, that you will look upon our request with sympathy.

In conclusion we earnestly ask you to accept our sincere thanks and deep gratitude for your past kindness and attention to us.

Very respectfully, yours,

(Rev.) IVAN BARTNOFSKY.

Prof. C. C. GEORGESON, *Sitka, Alaska.*

[The above letter arrived too late for last year's report.—C. C. G.]

FAIR RESULTS IN SPITE OF DRY SEASON.

TYONEK, ALASKA, *October 28, 1900.*

DEAR SIR: The present season has been extremely dry for agricultural purposes in many localities. At Tyonek during April, May, and most of July there was only about 3 inches of rainfall, and that was distributed so far apart that small seeds would not germinate. Many of the small seeds sowed in the latter part of April and first of May did not come up at all until the middle of August. Of those seeds that did come up, they made a rapid growth and matured early, considering the spring was bleak and cold. The general yield with me was the poorest in ten years, but other localities had better success. There was a fine vegetable garden raised 3 miles north of here. The mining camps of Sunrise and Hope produced excellent gardens; also the old trading station at Knik had fine gardens.

At Tyonek we had one cabbage to weigh 9½ pounds, trimmed close. Turnips, carrots, beets, ruta-bagas, and potatoes were very fine in quality, and cauliflowers and celery also did well; but we had to sprinkle the latter with a sprinkling pot for nearly two months. Radishes and lettuce always do well.

The Indian gardens did not amount to anything, outside of their potatoes.

Very sincerely,

THOS. W. HANMORE.

Prof. C. C. GEORGESON, *Sitka, Alaska.*

[This letter was received too late for last year's report.—C. C. G.]

GARDENING ON KNIK RIVER.

KNIK STATION, COOK INLET, ALASKA,
Via Sunrise City, October 12, 1900.

DEAR SIR: Your favor of July 17 just reached me. When you learn that the nearest post-office is about 80 miles from here, and that I have to go in a small sailing boat, in perhaps the most dangerous water on the coast for small boats, you may know that I take a trip only when necessary; so my mails are few and far between.

I have received no seeds yet, and it is hardly likely that another mail will reach me this fall, as navigation will soon close for the winter.

In regard to the seeds I planted last spring, will state that my knowledge of gardening is very limited, but have had very fair success so far. I have less than an acre in cultivation.

Parsnips are the finest and largest I ever saw, and the first I have heard of being raised in the vicinity.

Turnips grow to an enormous size, and of fine flavor. (Captain Glenn took a sample of my turnips last year to Washington.) This year my seeds were bad some way, as most of them went to seed. I don't know the reason why.

The Scotch kale is a perfect success here. Two men who came here from where it is raised extensively say it was the finest they ever saw.

Cabbage is small, but heading fast at present. They have heads about the size of a pineapple cheese, and are of a fine flavor.

Ruta-bagas are large and fine; have just taken mine into the root house. I had some so big that three filled a 30-pound candy pail.

Lettuce, peas, radishes, cauliflower, and potatoes are a success.

I made a failure of cucumbers, tomatoes, spinach, and parsley, and a partial failure of onions, but I think they could be grown from seed.

The natives above raised some potatoes, turnips, kale, cabbage, cauliflower, parsnips and radishes. They are very anxious to learn. I am a very poor teacher, as I must learn myself before I can teach others. Instructions about planting should go with all the seeds you send out. Some of my failures were due to my inexperience.

Yours, truly,

G. W. PALMER.

Prof. C. C. GEORGESON, *Sitka, Alaska.*

[Received too late for last year's report.—C. C. G.]

LARGE TURNIPS—INDIAN GARDENS.

KNIK, COOK INLET, VIA SUNRISE, ALASKA,
October 15, 1901.

DEAR SIR: Agreeable to your request I will send you a report of the seeds I planted last spring. These were the seeds you sent me a year ago. The seeds you sent me last spring were received too late for planting, so I did not try the wheat, oats, or clover seed.

The seed you sent me a year ago reached Tyonek too late to be forwarded by boat, and I had to send a native after them overland (about 100 miles or more). I have about one-sixth of an acre under cultivation and have not used any fertilizer; of course, the work has all been done by hand. I spaded the ground May 14 and 15. May 18 and 19 I planted potatoes, ruta-bagas, onions, turnips, parsnips, radishes, lettuce, beets, carrots, asparagus, peas, and mustard; of these all except the potatoes were in narrow beds. On May 30 I transplanted cabbage and cauliflower, and planted some cucumbers and beans.

Cucumbers, beans, mustard, asparagus, and onions were a failure because of dry weather. Radishes were destroyed by a white worm, which goes into the root and lives there until it is eaten up.

Lettuce, cabbage, cauliflower, and kale were not a good crop on account of dry weather in the spring. No rain fell here until July 5. I have to carry water a long way, so I do not water my plants at all.

The potatoes, turnips, parsnips, and carrots yielded well. I have 30 bushels of potatoes as fine as ever raised anywhere. One turnip weighed 17¼ pounds.

I have more than sufficient of all kinds for the winter.

Of the seeds you sent me, I gave what I did not plant myself to the natives here, and some of them raised some very good gardens, for the first working of the ground. I will give the grains a trial next year.

Clover and timothy I know will grow here, as it has come up where Captain Glenn had his hay piled, when he wintered his stock here, and is still growing, which proves that it does not kill out in the winter.

Should you send me some more seeds I will do the best I can with them. It will be a material help to the natives here to get them to raising gardens, as game seems to be getting scarcer every year, and unless the Government gives them some assistance they will, before long, have a hard time to live.

Thanking you for your past favors, I remain, yours, truly,

G. W. PALMER.

Prof. C. C. GEORGESON, *Sitka, Alaska.*

REPORT FROM SUNRISE.

SUNRISE, ALASKA, *October 25, 1900.*

SIR: Last spring I received a package of garden seeds from you, and a circular requesting accounts of the results obtained from efforts of gardening in this vicinity.

Owing to inexperience or ignorance, only the cabbage, turnips, peas, and potatoes turned out middling well. The cabbage formed heads weighing from 8 pounds down. One of the turnips measured 2 feet ½ inch in circumference and weighed 8 pounds, all of first-class quality. The peas and potatoes did very well; particularly those planted from seed of last season came up and blossomed two weeks earlier than those from seeds obtained from the States, which would seem to indicate an advantage in planting seeds grown in Alaska.

The land is new, and three years ago was covered thickly with spruce timber, stumps measuring from 1 to 2½ feet in diameter. Soil thin on top of gravel and bowlders. Fertilized mainly by wood ashes, particularly where the large stumps were burned out.

The experiments will be continued on an enlarged scale next year. It is intended to manure the lands with horse dung, and plant onions, parsnips, carrots, beets, cauliflower, and kale, in addition to the vegetables that flourished in the patch this year.

A. LARSON.

Prof. C. C. GEORGESON, *Sitka, Alaska.*

GARDEN SEEDS PLANTED AT COAL HARBOR, UNGA ISLAND, ALASKA, IN 1900.

COAL HARBOR, ALASKA, *October 24, 1901.*

DEAR SIR: Herewith please find my report upon the seeds which you sent me. Gardening with us is an old business. Some of your seeds did not do as well as they should have done, being perhaps not of the very best. The best of all would perhaps be those seeds raised from the soil where they are to be replanted. This is particularly true of potatoes and turnips. Your kale was a perfect success, continuing well into the winter months. Yearnings toward muskmelons and cucumbers are utterly hopeless, however. With us corn has proved a failure, but on the other hand, barley has matured and did well.

No. 1. Turnips, planted May 12, above ground May 21, harvested August.

No. 2. Kale, planted May 20, above ground June 1, harvested August.

No. 3. Radish, planted May 20, above ground June 1, harvested June 18.

No. 4. Parsnips, planted May 20, above ground June 2; destroyed by rats.
No. 5. Carrots, planted May 21, above ground June 8, harvested October 1.
No. 6. Potatoes, planted May 6, above ground June 21, harvested October 21.
No. 7. Lettuce, planted May 24, above ground June 5, harvested August 10.
No. 8. Cabbage, planted May 24, above ground June 8, harvested October 16.
No. 9. Onions, planted June 2, above ground June 15, harvested October 5.
No. 10. Cucumbers, planted May 20, above ground June 12, and died in a few days.
No. 11. Muskmelons, planted May 20; did not come up.
No. 12. Buckwheat, planted September, 1899, in rich and carefully prepared soil. Did not come up.
No. 13. Parsley, planted June, up in fifteen days; now in the ground, and doing well.

Remarks.

No. 1. Early White Milan variety. Well adapted to this soil and climate; grew quickly, and matured in forty days, and of good size. Cox Improved Yellow Ruta-Baga variety in the same soil, grew slowly; have not yet (October 23) matured, and have proved unsatisfactory. The Golden Ball always do well.
No. 2. Dwarf Green Curled Scotch variety has done exceedingly well; fit for use in sixty days after planting, and is still growing, and looking well.
No. 3. A perfect success. The white variety preferred.
No. 4. Thorburn Hollow Crown variety; slow growing; perhaps old seed.
No. 5. Chantenay variety. A success every way.
No. 6. California seed, Burbank. Fully matured; ripe and mealy; native seed comes up two weeks sooner.
No. 7. California seed, Prize Head, variety from E. J. Bowen, California, is the best, and last into winter.
No. 8. Early Winnigstadt variety. Quick growers, and large, but all leaves; would not head; not adapted to this climate. Small Drumhead being much better.
No. 9. Large Red Wethersfield. Do not mature except as green onions for table. Bottom sets do better.
No. 10. Early Green Prolific variety. At 1 inch above the ground died; climate too cold.
No. 11. Banquet variety. Seeds did not come up.
No. 12. Triple Curled variety. A perfect success.
No. 13. Buckwheat. Last year (1899) planted in the month of June; it grew well; height, about 2 feet. Flowers many and large, but did not pass beyond that stage. The attempt at fall planting was a total failure. Barley will grow and mature in sheltered places.

All of the above seeds were planted in the open without any forcing. The soil was composed of sandy loam, well fertilized with barnyard and stable manure, deep spaded. Under cultivation for some years. Our surplus seed was distributed to whites and natives in the neighborhood. Thus far no reports from them have reached us.

HENRY S. TIBBEY.

Prof. C. C. GEORGESON, *Sitka, Alaska.*

ROOT CROPS DID WELL.

SAND POINT, ALASKA, *September 13, 1901.*

DEAR SIR: The package of seeds which you sent me this spring was duly received, and can now tell you something of the results.

All the root vegetables were planted on May 22, in newly broken ground with very

little fertilizer. They have all done well save the onions, which have not amounted to much.

Of the oats, wheat, and barley I planted them in old tried fertilized ground, and also planted ordinary California chicken feed wheat in the same ground.

The California wheat beat all the other seeds, that being fully headed, and about 4 feet high when I cut it. I have made ensilage of that wheat, and also made the same amount of ensilage of our native grass, and shall watch for results now as to the relative values of the two for that purpose. I will let you know as to what the outcome is.

Very truly, yours,

H. Bohtt.

Prof. C. C. Georgeson, *Sitka, Alaska.*

REPORT FROM ROLL BROTHERS HOPE CITY.

Hope City, Cook Inlet, Alaska, *April 8, 1901.*

Dear Sir: Your seeds mailed February 28 came to hand April 24. We herewith send you the following report concerning our gardening in the season of 1900.

Carrots.—Parisian Forcing and Half Long Chantenay. The Half Long Chantenay did not germinate because the ground must have been too cold. Both kinds again sown May 25, coming up June 14. A 130-foot drill row produced 60 pounds medium carrots on two-year-old good soil. Parisian Forcing proved to be about 25 pounds more productive than the other kind on the same soil and bed. Sandy rich soil proves best for carrots in this part of Alaska.

Beets.—Extra Early Eclipse Blood Turnip, and Early Bassano Blood Turnip, and Early Blood Turnip. The first-named were sown May 8, in drills, and the two other kinds were sown May 24, also in drills; 468 feet of row produced 152 pounds merchantable beets. Extra Early Eclipse proved to be the best. Early Bassano produced large tops and shaded the ground too much, therefore not good for Alaska. Beets weighed from ¼ to 1 pound.

Beans.—Extra Refugee, planted in June, seeded ⅓ pound in a 100-foot drill, on three-year-old sandy soil; had blossomed by August 1, and by August 29 they were damaged some by the frost, and produced only 1 pound very small pods September 10.

Cabbage.—Early York, Early Summer, and Late Flat Dutch. The last-named did not get solid. The season is too short for a late variety. Seed sown in a box in the house came up April 1. Seed sown in hotbed outdoors March 27 came up April 13. Cabbage transplanted May 25, June 5, also June 13. Altogether 482 plants produced 972 pounds of cabbage (merchantable cabbage). Thirty of the late kind proved to be a failure. Thirty or forty of the early kind did not head or mature. On May 28 we had a heavy snowfall, about 1½ inches, which did a good deal of damage to the plants.

All plants were set 3 feet apart each way, and we had marked the first matured cabbage on the 14th day of August.

August 14, weight of cabbage as follows: 1 head, 2 pounds; 24 heads, 80 pounds; 5 heads, 16 pounds. September 15, 1 head, 8 pounds; 1 head, 6 pounds (3 weighed 17 pounds); 1 head, 5 pounds. December 13, weight of 41 heads, 164 pounds (made into sauerkraut). Each 4 pounds. The last week in October the weather was getting too cold for cabbage. We have had about 450 pounds in our root house. The house or cabin was made of a double log wall, filled in between with 18 inches of earth. The frost penetrated in the early part of the winter, therefore we had to keep the cold out by artificial heat. We have weighed the cabbages whenever we have disposed of any of them. At this writing we have on hand 17 heads.

The following are the directions we have used in growing our cabbage plants. We take a box from 15 to 20 inches deep; put 5 inches or more of fresh horse manure in the bottom, pack it close, and next 5 to 6 inches good, rich, old soil. Sow your seed and cover with very little moist soil. Have a window or glass to cover the box with, so no warmth can escape from middle of box. Keep the box outdoors, any place, but better on the south side of the building. Cabbage seed sown in this way will come up in ten or twelve days, even if the nights are from 10 to 16 degrees below freezing. To make good, hardy plants, keep box open if the weather is too warm.

Cauliflower.—Early Snowball transplanted the same time as cabbage in good, heavy, moist soil. They grew to the size of a dinner plate. The heads are firm and of excellent flavor. Cook Inlet, the garden spot of Alaska, proves to be the home for cauliflower.

Celery.—White Plume; seed sown in a box outside March 25, and transplanted June 15. The seed did not germinate very well and we obtained only about a dozen plants. I transplanted mine in very rich four-year-old soil. The stalks proved to be of medium size.

Kale.—Proved to do very well here.

Lettuce.—Does very well here in rich, moist soil.

Onions.—They have been a failure up to this time. We have noticed a fly, or mosquito, which kills the tops of the onions from 2 to 4 inches downward, and two or three flies will be found dead on the tops of each onion. The mosquito does much damage to the growth of the onions. No doubt if the proper onions can be obtained for this climate maybe they would grow here, as the flies and mosquitoes are not any more numerous than they have been since 1896.

Potatoes.—Early Rose and White Burbank, planted May 7 and again May 20. Fifty pounds of seed were used on a space of 77 by 32 feet on new, sandy soil, and produced only 568 pounds of potatoes. We have planted from 100 to 110 pounds potatoes other years, and we have had yields of from 1,900 to 2,000 pounds. Potatoes have produced only a small crop in 1900. The reason for this was most likely the dry weather. We had 1½ inches of snow on May 28. In June and also the beginning of July it was too dry for potatoes planted in sandy soil. The potatoes attained the size of from 8 to 18 ounces, but they were a little watery.

Parsnips.—Hollow Crown. They do about as well as carrots. One hundred and thirty feet drill row produced from 45 to 50 pounds of medium size.

Radish.—Early Scarlet Turnip, White Tipped, and Olive Shaped. The early turnip or twenty-eight day radish grows well here. The Half Long or Long Radish, also called Four Weeks Radish, never has proved to be very good, except late in the autumn whenever it is cold with a good deal of rain.

Tomatoes.—Atlantic Prize Extra Early. Grown in the following way: We put the tomato seeds in the same box we grew our cabbage plants in, after the cabbage plants were removed. We kept the box covered with a window at night and cold days until the tomatoes attained the height between the earth and the glass. In this way the tomato vines have grown 3 feet high, and the fruit as large as a goose egg. The fruit did not ripen, only attained a light golden color. After keeping in the house for three or four weeks the fruit was purplish red.

Turnips.—Early White Milan, and Purple Top White Globe. Were sown May 7, came up May 20. Two hundred feet of drill produced 612 pounds on poor sandy soil. The Purple Top White Globe will get as large as from 12 to 15 pounds if not seeded too close, and it is also a good keeper. Turnips can be sown early in the spring, and the last week in June or the first week in July again. We have marketed turnips July 25. At this date they weighed 9 ounces and over.

We also will try early corn this summer.

Ruta-bagas.—Yellow or Swedish Turnips. Sown May 24 and came up June 10.

Two hundred and eighty feet of drill row produced 488 pounds. They do as well here as in the States. They attain a weight from 1 to 8 pounds, and as a rule they will average about 3 pounds.

Yours, truly,

ROLL BROTHERS,
General Merchants.

Prof. C. C. GEORGESON, *Sitka, Alaska.*

FARMING ON THE NUSHAGAK.

MORAVIAN MISSION, NUSHAGAK, ALASKA, *August 4, 1901.*

DEAR SIR: I will drop you a few lines at this time to let you know that the thermometer and rain gauge came to hand safe and sound. I have as yet not set them up, as I have been very busy with fish catching, gardening, and haymaking, besides very many other duties; not the least of which is the post-office, of which I have charge. I shall endeavor to set them up and take records by September 1.

The seeds came all right. Some were planted, while others were kept over for next spring.

Thus far, this has been a remarkable summer, the like of which I have not seen in the five years of my Alaska life; dry and hot, so that often one felt like keeping still and cooling off.

It took a long time for the seeds to germinate, but they finally did, and now the gardens are a beautiful sight. We have very little competition in that line, so we have praise from visiting parties. We are, however, not the only ones who try to raise vegetables, as quite a number of our neighbors have gardens, and a few natives. The white settlers are all fishermen, and at the time when gardens need most attention they must be on the river catching fish. The natives, too, have spent what time they might devote to it in drinking and being "all same white man."

Everything planted seems to be doing well. Even the corn woke up during the warm weather, and if we had had some warm rain it would likely have come to something this year. I don't believe, however, that corn will do well, as a rule, here.

While I was attending to fishing, etc., the sisters waged war against the worm, which spoiled so much of our underground crop; first, wood ashes were put to all turnips and the like, but still they came. We then brought some lime from the cannery and each stalk was trenched around and a liberal pile of lime placed at the root. This checked the worms to some extent, but some go through even lime. When we dug the garden we put considerable lime on. It seems that these worms are possessed of constitutions to stand any test Alaska can furnish.

I dare say you will be interested in the growth of the grains you sent me; they are doing fine, I think. They were all planted on or soon after May 15. On account of the dryness they did not spring up very promptly, but I think most of them will mature and ripen this year. The Romanow wheat is just splendidly loaded; the oats are also doing well, but a little behind time. I have barley from a Dakota farmer which beats anything I have yet seen. Wheat (spring) from Dakota is headed, but I am afraid not as heavily as it does in its native State. I have Pennsylvania oats which is about on a par with the other.

I have sown two beds of clover, red and white, which are doing nicely, but at this writing I see no signs of blossoms. I hope it will yet mature, as clover is one of the grasses I much desire to have. I wonder how timothy grass would do here?

At last I have a cow (calf). At one of the canneries they had a cow which gave no milk, and in due season she had a calf. The men wanted to kill it at once, so they might the sooner have milk. I asked to be allowed to raise it, so am

teaching it to drink out of a bucket. It is now a week old and just begins to drink nicely. The cannery men were generous enough to give me a few quarts of milk each day, so that with a little scalded meal the calf has been faring pretty well.

I have made quite a little hay, and would have more of what I made first if it had not made me so much trouble. I think I must have put it in a little too soon, as it got too hot and molded. I had to throw it all out and dry it over, which took several days. The result is that my once fine hay is now second class. And just to-day the weather changes, and rainy weather is upon us. I think I may have a few more days of fine weather. The grass is getting very hard and coarse now.

I will not be able to build a silo this year, but hope to build a log barn as soon as I can raft the logs home. If the rains prevent any more haymaking, I will have to be satisfied with a hole in the ground for my silo.

I have tried to make use of some of the fish refuse (heads and backbone), but I am afraid my way is too offensive. I hauled a lot to the barnyard, and covered it with manure, but the flies soon had it in a terrible mess. I have heard that fish makes a good fertilizer, but I guess that I do not use it right. Can you give me advice as to how to use it?

Yours, truly,

(Rev.) S. H. Rock.

Prof. C. C. Georgeson.

[Work the fish refuse into the ground before it decays.—C. C. G.]

Moravian Mission, Nushigak, Alaska, *August 29, 1901.*

Dear Sir: I will add a few lines to what I have written under an earlier date. How I wish you could have a look at our garden. Everything is tropically inclined, I think. We have made a nice barrel of sauerkraut, and greens of all kinds have been our bill of fare for weeks.

I hope to harvest a good crop of potatoes, celery, peas, beets, and ruta-bagas. The cauliflower was lovely this year again. The lime treatment for turnips seems to have been quite a good one.

All the grains and grasses are doing splendidly, only I fear the rainy season which is upon us will hinder their full development. The barley from Dakota has fallen flat on account of heavy weight. The Romanow wheat stands all of 5 feet and is heavy with grain. The Dakota and Pennsylvania oats are also ripening.

The clover is now in blossom, but I don't think the seed will ripen; time will tell.

I sowed a bed of winter wheat which is well started now, so by next spring we will be able to report on it also. The straw of all these grains is extra heavy and of a deep green color. The Dakota wheat and Pennsylvania oats are a little behind the others.

I would like to ask what is the reason of the cabbage bursting before the head has attained any size? Many of our cabbages had to be cut on that account.

The sugar-peas planted by the sisters stand 6½ feet, and are just as full of peas as they can hang, and new blossoms are coming every day.

The American Wonder and Little Dandys are also yielding well. I think a sprinkle of lime has perhaps helped them some. They were planted on the bed where I had barley and oats last year.

If I were not so busy I would take a picture of the garden for you; may do so later.

My stock is getting along nicely. The chicks are growing nicely and the calf is beginning to nibble grass. The cow took sick a week ago and had to be killed, as nothing could be done for her. She began by limping in her right hind foot, and

someone said she had gotten foul of her rope and thrown herself and that the dogs then bit her. The dog bites, however, were very slight.

Well, I will have a litter of pigs in a few weeks, then my troubles begin anew.

Yours, truly,

(Rev.) S. H. Rock.

Prof. C. C. Georgeson, *Sitka, Alaska.*

Carmel, Nushagak River, *June 5, 1901.*

Dear Sir: The vegetable seeds that you wrote you had sent to me on February 28 arrived here June 18. Very many thanks for the same. I will be able to use only the radish and lettuce seeds this season and they are already in the ground. The others I will give a good trial next year. I also planted part of the rhubarb seeds; they are just showing, but I will watch them closely and try and raise some good ones.

The flower seeds you sent me in February I sowed also. Only the nasturtiums, pansies, and pinks have as yet come to any size, in fact most of the others are not up at all; although the phlox, poppies, petunias, and alyssum and larkspur look as though they may yet grow nicely. I hope to have some asters and mignonette for next spring. The Tom Thumb nasturtiums have done finely and are in bloom.

In looking over the seeds and list I find that there is no cauliflower. As I understand from several other parties that you sent snowball cauliflower seed to them, I feel somewhat disappointed. I have heard from parties passing through here that they are such a fine strain, and I would like to try them, but I can not get seed from Philadelphia in time for next year. I will carefully tend them and report at the end of the season.

Very truly, yours,

P. C. King.

Prof. C. C. Georgeson, *Sitka, Alaska.*

FLAX, BUCKWHEAT, AND BARLEY MATURED AT TANANA.

St. James Mission, Tanana, Alaska, *April 27, 1901.*

Dear Sir: Thanks for seeds. Will keep you posted as to what is accomplished this year. I raised last year turnips, Purple Top, 9¾ barrels from the seed sown in June, and pulled in early September the flax, buckwheat, and wheat and barley. All matured, but the stalks were very small and weak.

Yours, truly,

Alfred A. Selden.

Prof. C. C. Georgeson, *Sitka, Alaska.*

RADISHES, TURNIPS, AND LETTUCE ON KOTZEBUE SOUND.

Kotzebue, Alaska, *April 22, 1901.*

Dear Sir: Your favor of last year was received in August, 1901, consequently we have not tried the seeds. We will try this present spring, and report the results to you. With our own seeds we have only been successful with radishes, turnips, and lettuce, but think with hotbeds other things might be a success.

Yours, respectfully,

Robert Sams (Missionary).

Prof. C. C. Georgeson, *Sitka, Alaska.*

GARDENING A FAILURE AT POINT BARROW.

EAGLE, ALASKA, *July 25, 1901.*

DEAR SIR: I tried some of the seeds sent me to Point Barrow, but all results were negative. The plants grew, filled the windows with a beautiful foliage, blossomed, and died; at no period was anything edible apparent.

It is impossible to plant outside, as on the evening of the hottest day it is apt to be below freezing.

However, if more seeds are sent, I will do my best to raise something. We did not try anything but radishes and lettuce, and the latter never appeared at all.

I am on my way in after a year on the outside.

Sincerely, yours,

(Rev.) H. R. MARSH.

Prof. C. C. GEORGESON, *Sitka, Alaska.*

DISTRIBUTION OF SEEDS.

During the past year, as heretofore, hardy garden seeds, a few flower seeds, and some early maturing grains have been distributed to persons residing in the Territory who either had made application for them or who seemed likely to take an interest in their culture. This seed distribution may be regarded as legitimate experimental work. The recipients become cooperators with the experiment stations, and frequently their experience is valuable, in that it may point to a general truth. Moreover, this distribution of seeds stimulates the development of agriculture. Many people who would not have made gardens or attempted to raise crops except for the timely arrival of seeds have been induced to do so, and their example has influenced others to apply for seeds and to attempt the growing of vegetables or grains. The result is that there are gardens in hundreds of places where there otherwise would not have been any. Brief directions on their culture are sent out with the seeds for the benefit of those who have had no experience in that line, and correspondence on the subject of the cultivation of crops of every kind has been solicited and is promptly attended to.

The foregoing letters are samples of the reports which are received at the station bearing on this subject. This distribution of seed has also had the effect of encouraging the natives to engage in gardening. It is true that as yet results are but limited, but we are casting bread upon the waters, and we shall see results later on. The Indian, as a rule, has a good stock of hard common sense. When he sees that by cultivating a little patch of ground he can raise a few bushels of potatoes or turnips or anything else which will help him to eke out an existence, he is, as a rule, not averse to trying the experiment. The Indian is not an enterprising character, and probably but few of them will ever become farmers in the proper sense of the word, but his food supply in most parts of Alaska is gradually diminishing, and he is aware of this. Many settlers, as well as some of the missionaries, have expresed the view that the Indian must either take to the cultivation of the ground in order that the products of the soil may help him to obtain

a living, or else he will be a Government ward and maintained in whole or in part by the Government, if indeed he is not left to starve. The former alternative is, of course, the more preferable, and this distribution of seed is an aid to that end. For assistance in this work I depend wholly on missionaries and on well-disposed white men to whom the seed is sent and who are requested to share with the natives in their neighborhood and to instruct them how to grow the seeds. I am glad to say that many of the white people take an interest in this matter and go out of their way to help in the work.

A few flower seeds were purchased and distributed for the first time last fall. These seeds were highly appreciated, and, as a rule, they have been cultivated with much success. They have helped cheer many a home in the wilderness, and to that extent have been of real service.

I have also distributed small packages of early maturing grain, more particularly of barley and oats. Some of this grain has been sown in regions where grain had never been grown before, as, for instance, on the Tanana and in the Copper River country, and in some cases seed has been matured in spite of the fact that the ground has been new and raw. These are experiments of real value.

I recommend that the distribution of seeds be continued, and if possible extended.

The following is a copy of the instructions I sent out with the seed:

UNITED STATES DEPARTMENT OF AGRICULTURE,
Office of Experiment Stations, Sitka, Alaska.

GENERAL DIRECTIONS FOR CULTURE.

As a guide to those who have had but little experience in growing vegetables and grain in Alaska the following suggestions are offered:

(1) As far as practicable use old ground, that is, ground which has been under culture for some years. New ground is almost invariably unproductive. It lacks available plant food and it is too sour. The seed will germinate in such soil and the young plants appear above ground, but they make but little growth, and in the course of two or three weeks they turn yellow and die. The climate is often erroneously blamed for failures of this kind.

(2) When new ground must be used its defects can in a measure be remedied by a heavy application of some good fertilizer. Fish guano has proved to be of much value at the Sitka Experiment Station for this purpose. It should be applied at the rate of about 300 pounds to the acre. Seaweed thoroughly worked into the ground is also good. Likewise stable manure and chicken dung. A dressing of quicklime will neutralize its acidity and be especially helpful to such plants as peas, beans, and the clovers.

(3) See that the ground is thoroughly drained. If good drainage can not be secured in any other way, raise the beds a foot and make them 3 feet feet wide on top and sow 2 rows of seed on each bed.

(4) Avoid thick seeding. Sow thinly in rows 2 feet apart and cover lightly. Thick seeding is not only a waste of seed, but crowded plants can not develop normally.

(5) The rows should run north and south to give the sun a chance to warm the ground between them.

(6) Stir the ground between the rows at least every two weeks, and pull all weeds when they appear.

(7) When obtainable, use fertilizers freely on old ground as well as on new.

SPECIAL DIRECTIONS FOR CULTURE.

Asparagus.—Sow in rows 2 feet apart in early spring and on very rich soil. Preferably the rows should be dug out 6 inches deep and filled with old manure before seeding. Stir the ground frequently during the summer. Late in the fall cover the plants with long manure or with hay or straw for winter protection. If the following spring the plants are strong and of good size, they can be planted out on a permanent bed; if weak and small, let them grow in the seed bed for another season and transplant them the spring following. Make a bed 3 feet wide on well-drained ground. Dig the earth 1½ feet deep, and in so doing work in a layer of stable manure a foot thick. This will raise the bed a foot. Set two rows of plants 1½ feet apart in the rows and 4 inches deep. The second year thereafter some of the more vigorous shoots may be cut. Seaweed can be used as a substitute for manure. Cover the bed every fall with manure or seaweed, and work it in in the spring, taking care not to injure the roots. The shoots will be small and spindling unless the soil is rich.

Beans, wax.—Plant in a warm, sunny place in rows 2 feet apart, but not until settled warm weather begins. They can not be counted on to produce edible beans unless grown in a dry, warm place.

Beans, Windsor.—Drop beans 4 inches apart in a row late in the spring. They are hardier than wax beans and will be successful in Alaska in all ordinary seasons. The beans are shelled and used as Lima beans when nearly full grown. They are quite equal to the latter in flavor.

Beets.—Sow very thinly in a row in early spring. When 2 inches high, thin the plants to 4 inches apart in the row.

Carrots.—Sow very thinly in a row in early spring; thin the plants to 3 inches apart.

Cabbage.—Fill a box 6 inches deep with rich, old soil and set it in a sunny window in the house. Sow the seed thinly in this about the 1st of April. Keep the plants watered and give them all the light possible. As the spring advances set the box out in sunshine during the day and shelter it at night and finally leave it out altogether. If well cared for, there will be nice plants ready to plant out about June 1. Plant on rich soil, 2½ feet apart each way. A cold frame, or, better still, a hotbed, can of course be used to raise the plants in instead of a box.

Cauliflower.—Same as cabbage.

Celery.—Raise the plants as directed for cabbage, except as follows: The seed is very fine. Sow it on the surface of the soil and cover it very lightly with sandy earth sifted over it. The plants grow slowly, but will be ready to set out by the middle of June. Set them 4 inches apart in a row, on especially rich and well-prepared soil. Blanch the stems by drawing the earth about the plants about the middle of September. Protect from early frosts.

Cucumber.—Plant seed in small pots (two seeds in a pot) in April. Keep in a sunny window or in a hotbed. Harden plants gradually during latter part of May. Plant out on rich soil in hills 2 feet apart in June. Be sure that the earth is not knocked from the roots in turning the ball out of the pot. The plants will not grow if the roots are disturbed. Cucumbers can be planted in the open in the latter part of May, but they are less certain of success than by the above plan.

Kale.—Treat as directed for cabbage and cauliflower.

Lettuce.—Sow a little in a box in early April and transplant when warm enough. Sow outdoors in May. Transplant to 6 inches apart.

Mustard.—Sow in a row in early spring and cut it for greens. Allow some of it to go to seed to supply seed for next year.

Onions.—Sow very thinly in a row on warm, well-drained soil as early as the ground can be worked. Some of the reasons for failure are too thick seeding (the plants should be at least 3 inches apart), too poor soil, and poor drainage. Save the small onions and use them for sets next year.

Parsnip.—Treat as directed for carrots; but they need more room. Plants should be at least 4 inches apart in the row.

Parsley.—Sow thinly in a row. The leaves are used for garnishing and flavoring.

Peas.—Plant in rows in early spring. Support vines with short, bushy brush.

Radish.—Sow a little in a row once every ten days from the opening of spring.

Rhubarb.—Sow thinly in a row on rich soil in early spring. Let the plants remain over winter where they grew, but protect them with a layer of hay, straw, or long manure. The following spring plant them out in some sheltered corner of the garden 3 feet apart each way on rich, well-prepared ground. With liberal manuring, winter protection, and working of the soil in summer they will last a dozen years.

Spinach.—It requires rich, well-drained soil. Sow about the middle of spring in a row.

Turnip.—Sow thinly in early spring and again about the first of July. Don't let the plants crowd each other.

Ruta-baga.—Sow thinly in rows, in early spring, and thin the plants till they are 9 inches apart.

Red clover, white clover, and Alsike clover.—A small package of each of these clovers is sent out to test them in Alaska. Sow thinly on well-prepared ground. Protect from animals. Note if they live through the winter, and if so let them go to seed and note if the seed matures. Do not mix them nor sow them with grasses of any kind.

FIELD GRAIN.

A small amount of field grain will be distributed consisting of Romanow spring wheat, Manshury barley, and Finnish Black oats and Burt Extra Early oats. These grains are sent out with a view to test their adaptability to different regions of the Territory. Those who receive them are requested to give them a careful trial on good soil. The general directions as regards soil which are given above for the culture of vegetables should be observed. Only a very small quantity of seed of each can be supplied, and it is recommended to sow it in rows 2 feet apart and hoe the rows as in the case of vegetables. Sow them as soon as danger of severe frost is over.

Romanow spring wheat.—This is the earliest spring wheat which we have so far tested at the Sitka Station. It has matured wherever tried in Alaska. It has a good straw, fine heads, with brown chaff and short beards. It was imported from northern Russia by the United States Department of Agriculture.

Manshury barley.—This variety is one of the earliest tested and has never failed to mature wherever tried. It is quite commonly cultivated throughout the Northern States.

Finnish Black oats.—The seed sent was imported from Finland in the fall of 1900. It has not been tested in Alaska, but it is believed to be as early as any variety known.

Burt Extra Early oats.—This is a variety which has matured in Alaska wherever tried. It is grown to a limited extent in the Northern States.

SAVE THE SEED.

Those who succeed in maturing these grains are earnestly requested to save the seed and to continue growing them year by year in order to obtain a stock of Alaska-grown seed. The Romanow spring wheat and the Finnish Black oats can not be supplied again.

C. C. GEORGESON,
Special Agent in Charge of Alaska Investigations.

DISTRIBUTION OF TREES AND PLANTS.

I strongly recommend the distribution of trees and plants along the same lines and for the same purposes that the seed is distributed. If it is difficult for settlers to get seed under the present conditions, it is ten times more difficult for them to get plants and trees. We do not know what kind of fruits can be grown in Alaska because none has been tried. There is an old apple tree at Sitka planted by the Russians upward of forty years ago and a young tree at Wrangell. Both of these bear fruit every year, but the fruit is of inferior quality. They are the only fruit trees of bearing age I have heard of. It is of vital importance that experiments should be made in many different parts of the Territory in order to determine the possibilities in fruit growing and the delimitations of the fruit belt, if, indeed, there is one. To do this, I propose, if my plan is approved, to establish a nursery at the headquarters station, propagate all kinds of hardy fruits and send out trees and plants in limited numbers and under proper restrictions, to settlers free of charge. By this means numerous tests can be made and valuable information secured. Moreover, it will help the development of the Territory. The expense would be but a small matter to the Government, but it would mean a great deal to the pioneers. The work should be begun at once. We are ready to take it up if the appropriation makes it possible. If this feature is added to the experiment station work, it will require about $2,500 additional appropriation to procure a modest stock of trees to begin with, to pay for freight and labor, and to pay the salary of a competent, active propagator for one year.

WHAT THE DEVELOPMENT OF AGRICULTURE MEANS.

The development of agriculture in Alaska means the settlement and development of the Territory. The one line of growth is synonymous with the other. It means the building of homes, a permanent population, a powerful aid to the development of the mineral resources, the creation of wealth, and the building of a state. The mineral resources of the Territory have not been fathomed. We only know that they are vast, and that it must take a long time to exhaust them. But great as is this hidden wealth, it can not build a state unaided. If agriculture can not be, or is not developed in the Territory, Alaska must forever remain what it now is—a distant mining camp, with its base of supplies on an average nearly 2,000 miles away. The population would shift and dwindle in the placer districts with the exhaustion of the mines. Permanent settlements could be possible only in quartz mining districts, and the mines would of necessity be owned by capitalists who probably would not live there. Alaska would then be a place where the poor man could live only as the servant of the rich. If a pros-

perous and sovereign state could be born of such conditions, it would be the first instance in history. The argument has been advanced that the development of agriculture would prejudice the mining interests. Such an argument is illogical and untenable. On the contrary, it would be of the greatest possible advantage to mining; it would reduce the cost of living, labor would be more plentiful, interior roads would be built, transportation facilitated, the country would be better known, and, therefore, capital for development would be more easily obtained. Nor is mining the only industry which would be benefited. The wants of the settlers would increase the business of the merchant, there would be a greater demand for transportation, the larger the population the greater would be the trade with the coast ports, the resources would be developed, and a powerful state would be added to the Union.

WORK OF THE PIONEER.

Alaska is settled by pioneers. It is the work of the pioneer which has brought her resources to light and which enables her to help in enriching the world. If Alaska ever becomes great and powerful, if the constellation of the flag is enriched by the addition of a star which shall represent Alaska, it will be due to the work of the pioneer. And by pioneer I mean not only the prospector and miner, farmer and fisherman, but also the merchant, the missionary, the mechanic, and all who by their efforts assist in the great work of development. If an agricultural industry worthy of the name is developed in the Territory, it will be due to the pioneer. His task is an arduous one. In addition to the privations and hardships which are always incident to the subduing of a new country, he has to battle with a climate which is inhospitable during a large portion of the year; he is far from home and kindred; the expenses which he has to meet for transportation and supplies are excessive, and he has to face great personal hardships. The Government has spent, and is spending, great sums in erecting military establishments in various parts of the country, all of which, of course, is an aid to its development, but the work of the pioneer is of still greater value. The writer would respectfully submit that it would be to the advantage of the Government to facilitate and assist him in the work in every way possible. Whatever facilitates the work of the pioneer goes to the benefit of the Government—it is returned in the development of the Territory. From the standpoint of the development of agriculture, I would respectfully submit that greater forward strides would be made, more would be accomplished, and the Government would, in the end, be the gainer, if the law permitted settlers to go in, and, under proper restrictions, take up 320 acres, or even only 160 acres, without cost and without the restrictions which now make it impossible for the poor man to get title to land.

SURVEYING LANDS.

The first and indeed the most essential step in the development of agriculture in Alaska is the surveying of the public lands. At present no one can get title to farming land in Alaska except by the use of soldiers' additional homestead scrip, and this costs more than the average settler can afford to pay. But when obtained it does not represent more than a small part of the total cost. The settler must at present pay the cost of the survey. This cost is excessive. United States deputy surveyors charge $15 to $20 a day, besides traveling expenses and other incidentals. So that by the time one gets title to a farm in Alaska it will have cost him as much as he can buy good improved land for in the States. As long as this condition prevails, Alaska can not be settled and agriculture can not be developed.

COOPERATIVE EXPERIMENTS ON WOOD ISLAND.

I have made an arrangement with the superintendent of the Baptist Orphanage on Wood Island, the reverend Mr. Curtis P. Coe, whereby he will cooperate with the experiment station in carrying out certain experiments. The station is to furnish him with the necessary implements, seeds, and work animals. He will then defray all of the expenses for the work and use land which belongs to the mission. A series of experiments have been planned for next year along the line of the growing of forage and grain crops.

EXPERIMENT STATION IN THE COPPER RIVER COUNTRY.

The information herewith submitted concerning the Copper River country indicates that this extensive region is perhaps the most favorable locality for agriculture in all Alaska. I recommend that a station be established there next summer. To do this, however, means the hiring of a competent assistant, the building of a house and barn, the importation of oxen or horses, and also of farming implements. These are the necessary equipments. The hiring of labor will be additional. At the least calculation all this will cost about $5,000 for the first year. The transportation of supplies from Valdez to the the interior is very expensive. Last summer it cost 50 cents per pound for transportation of supplies from salt water to Copper Center, 103 miles, and it will cost relatively more for greater distances. If my recommendation meets with approval and a station is established there, we should, of course, own the pack animals and transport the supplies ourselves.

PLANS FOR FUTURE WORK.

During the coming year it is essential that the Rampart Station should be equipped with the necessary implements for work. For that station a team of horses is needed, a wagon, two plows, a disk

harrow, a smoothing harrow, a grain drill, and hand tools of the usual kinds. To lay these things down in Rampart will cost about five times their original value on Puget Sound. In addition, a house and barn should be built, both of logs. There is plenty of timber on the reservation for this purpose. Besides these, the salary of a competent superintendent and at least two laborers during the summer season must be provided for. This meager equipment, including labor for a year, will cost about $5,000. The work which should occupy these stations will, to begin with, consist mainly in the growing of vegetables and grains in order to establish by actual tests what can be grown there, and the best methods of culture.

At the Sitka and Kenai stations the work already under way should be continued. More land must be cleared in both places and the work extended. As mentioned in the foregoing, a nursery should be established at Sitka, so that we may propagate and distribute hardy fruits to settlers for tests in various parts of the Territory.

It is also of much importance to begin work with the propagation and improvement of several of the native fruits. There are five species of huckleberries, two or three species of cranberries, a crabapple, strawberries, currants, and raspberries, all indigenous to Alaska, and all of which have merits which recommend them for domestication. The native grasses and forage plants also deserve attention, and if the funds permit, work should be undertaken with a view to establish the relative merits of the several species. Grasses of all kinds grow luxuriantly in the coast region wherever they are not driven out by the spruce. The treeless region of western Alaska has an abundant supply of grass, and stock raising is destined to become an important industry in that part of Alaska. And, as shown in this report, there are also large areas of grass land in the interior, where stock can be raised in summer and hay can be made for winter feed.

The improvements which should be made during the coming year include the following:

SITKA STATION.

1. Finishing the headquarters building in accordance with plans.
2. Furnishing a laboratory with the necessary apparatus.
3. Building of two more cottages.
4. Building a small propagating house.
5. The purchase of another yoke of oxen.
6. The purchase of three cows and a bull, as a foundation for a herd.
7. The purchase of additional implements.
8. The establishment of a nursery.
9. Extending the clearing.

KENAI STATION.

1. Extending the clearing.
2. The purchase of additional implements.

RAMPART STATION.

1. The building of a house.
2. The building of a barn.
3. The purchase and importation of a yoke of work oxen or horses.
4. The purchase and importation of the necessary implements.

ESTABLISHMENT OF COPPER RIVER STATION.

1. The selection and survey of a tract of suitable land.
2. Building a house.
3. Building a log barn.
5. The purchase and importation of a yoke of work oxen or horses.
5. The purchase and importation of the necessary implements.

SEVERAL SUBSTATIONS NECESSARY.

The vast extent of territory in Alaska and the great variation in climatic conditions make it necessary that there should be several substations. The places where stations have already been established are believed to be the best that could be selected, and a station somewhere in the Copper River country is equally necessary. I would respectfully call attention to the fact that each of these substations requires a separate equipment and a separate set of men, which multiplies the expense as compared with a single station. It is also to be noted that the equipment of the stations and the cost of labor will amount to anywhere from two to five times what it would cost to equip and work similar stations in the States. The lower rate applies to the coast stations and the higher to the interior stations.

INTRODUCTION OF DEER ON THE WESTERN ISLANDS.

My instructions directed me to ascertain in what manner it might be practicable to introduce deer on Kadiak and adjoining islands. An investigation of the subject was made, and the conclusion is that the most feasible method for the introduction of deer on these islands is to hire Indians to catch the fawns early in the spring, and when a number have been collected, ship them out and turn them loose at some place where they can be looked after and protected from dogs and hunters alike. The fawns can be obtained from almost any of the islands in southeastern Alaska, and the expense connected with the enterprise should not be great. It has been suggested that Wood Island could be made a nursery for deer. The Rev. Mr. Coe has agreed to take the matter in charge there, his mission being located on the island.

The enterprise is proposed as a measure of relief to the natives at Kadiak and elsewhere in that region. There are no deer on these islands, and with the practical extinction of the fur seal and other fur-bearing animals in that region, which have been an important source of income to the natives, they are now at times on the verge of star-

vation, a condition which the introduction of deer would probably ameliorate.

WANTON SLAUGHTER OF GAME.

In this connection I am constrained to mention that in certain parts of Alaska game is destroyed wantonly and in great number. This is the case, for instance, on the Kenai Peninsula. Hunters, not only from this country, but from foreign countries, go there and kill animals, particularly moose and mountain sheep, for the sake of the antlers and heads. I have myself met hunters of this class there every time I have been in the peninsula.

And in southeastern Alaska the Indians kill thousands of deer for the sake of the skins, which they sometimes sell as low as 20 cents apiece, though the average price is more than that. The number of deer skins bought up and exported from nearly every Indian settlement in southeastern Alaska is an index to this kind of wanton slaughter. The remedy would seem to be to prohibit the exportation of the skins and antlers of moose, caribou, mountain sheep, and deer.

WORK AS SPECIAL DISBURSING AGENT.

In order to facilitate the Alaska work, I was appointed a special disbursing agent of the Treasury Department in the summer of 1900. I have in this capacity disbursed the sums which the Treasurer of the United States has from time to time deposited to my credit in Seattle.

SOIL TEMPERATURES.

The tables submitted herewith give the detailed soil temperatures for the places and periods named. The readings are taken from two thermometers, one planted 6 inches deep and the other 24 inches. At stations which are equipped with radiation thermometers the readings of this instrument are also given. It is suspended about 6 inches above the surface of the earth and is not covered. It gives the minimum daily temperature as the vegetation feels it. There appears to be much similarity in the readings for corresponding months at each station, but the period of observation is yet too short to make generalizations.

Soil temperatures.

SITKA EXPERIMENT STATION.

Day.	6-inch thermometer.	24-inch thermometer.	Radiation thermometer.	Day.	6-inch thermometer.	24-inch thermometer.	Radiation thermometer.	Day.	6-inch thermometer.	24-inch thermometer.	Radiation thermometer.
1899.	°F.	°F.	°F.	1899.	°F.	°F.	°F.	1899.	°F.	°F.	°F.
May 1	42	.....	.....	May 7	40.5	.....	.....	May 13	42.5	.....	.....
May 2	42.5	.....	.....	May 8	41	.....	.....	May 14	42.5	.....	.....
May 3	41	.....	.....	May 9	41	.....	.....	May 15	43	.....	.....
May 4	41	.....	.....	May 10	41	.....	.....	May 16	43	.....	.....
May 5	41	.....	.....	May 11	42.5	.....	.....	May 17	46	.....	.....
May 6	42	.....	.....	May 12	42.5	.....	.....	May 18	46	.....	.....

Soil temperatures—Continued.

SITKA EXPERIMENT STATION—Continued.

Day.	6-inch thermometer.	24-inch thermometer.	Radiation thermometer.	Day.	6-inch thermometer.	24-inch thermometer.	Radiation thermometer.	Day.	6-inch thermometer.	24-inch thermometer.	Radiation thermometer.
1899.	°F.	°F.	°F.	1899.	°F.	°F.	°F.	1899.	°F.	°F.	°F.
May 19	45.5	.....	.....	Aug. 4	58	54	51	Oct. 20	41	45	25
May 20	46	.....	.....	Aug. 5	57.5	54	50	Oct. 21	40	45	24
May 21	47	43	.....	Aug. 6	57.5	54	50	Oct. 22	40	45	26
May 22	48	43	.....	Aug. 7	57	54	48	Oct. 23	40	45.5	24
May 23	46.5	43	.....	Aug. 8	57	54.5	48	Oct. 24	40	45.5	24
May 24	45.5	43.5	.....	Aug. 9	56	54	51	Oct. 25	41.5	45	38
May 25	45.5	43	.....	Aug. 10	57	54	45	Oct. 26	42	44	30
May 26	45.5	43.5	.....	Aug. 11	57	54	45	Oct. 27	43	44	38
May 27	45.5	43.5	.....	Aug. 12	56.5	54	49	Oct. 28	43	44	40
May 28	46	43.5	.....	Aug. 13	56	54	43	Oct. 29	41	44	33
May 29	47.5	43.5	.....	Aug. 14	57	54	45	Oct. 30	42	44	34
May 30	47.5	43.5	.....	Aug. 15	57	54	48	Oct. 31	40	44	32
May 31	46.5	43.5	.....	Aug. 16	57	54	53				
June 1	47	44	32	Aug. 17	57	54	51	1900.			
June 2	48	44	32	Aug. 18	57	54	47	May 1	48	44	34
June 3	46.5	44.5	35	Aug. 19	56	54	46	May 2	47	43.5	31
June 4	46.5	44.5	35	Aug. 20	56	54	39	May 3	48	44	43
June 5	46	44.5	35	Aug. 21	55.5	54	40	May 4	47.5	44.5	42
June 6	47	44.5	35	Aug. 22	56	54	46	May 5	44	44.5	27
June 7	47.5	44.5	42	Aug. 23	55.5	54	46	May 6	46	44.5	36
June 8	47	44.5	42	Aug. 24	55	54	41	May 7	44.5	44.5	33
June 9	48	45	46	Aug. 25	55	54	40	May 8	47.5	44.5	39
June 10	48	45	43	Aug. 26	55	54	39	May 9	47	45	36
June 11	48	45	43	Aug. 27	55	54	38	May 10	47.5	45	39
June 12	49	45.5	46	Aug. 28	55	54	38	May 11	47.5	45	30
June 13	50	45.5	46	Aug. 29	55	54	46	May 12	48.5	46	33
June 14	49.5	45.5	44	Aug. 30	55	54	50	May 13	49	46	44
June 15	48.5	46	37	Aug. 31	55	54	45	May 14	49	46.5	41
June 16	49	46	36	Sept. 1	55	54	45	May 15	50	46.5	42
June 17	49	46	36	Sept. 2	54	54	44	May 16	50	46.5	42
June 18	48.5	46	36	Sept. 3	53	53.5	38	May 17	48	47	41
June 19	50	46.5	36	Sept. 4	53	53.5	40	May 18	47	47	36
June 20	50	46.5	44	Sept. 5	53	53.5	42	May 19	47.5	47	36
June 21	50	46.5	39	Sept. 6	53	53	43	May 20	49	47	41
June 22	50	46.5	38	Sept. 7	53	53	38	May 21	47.5	47	32
June 23	50.5	47	39	Sept. 8	53	53	38	May 22	50	47.5	33
June 24	50	47	38	Sept. 9	53	53	38	May 23	48	47.5	30
June 25	50	47.5	40	Sept. 10	53	53	47	May 24	48	47.5	34
June 26	52	47.5	47	Sept. 11	53	53	43	May 25	47.5	47.5	34
June 27	52.5	47.5	46	Sept. 12	53	52.5	46	May 26	50	47.5	39
June 28	52	47.5	45	Sept. 13	52	52.5	52.5	May 27	49	47.5	39
June 29	52	47.5	45	Sept. 14	52	52.5	50	May 28	49	47.5	39
June 30	51	47	44	Sept. 15	52	52.5	50	May 29	48	47.5	40
July 1	51	48	46	Sept. 16	53	52.5	45	May 30	48	47.5	37
July 2	53	48	47	Sept. 17	52	52	48	May 31	45	47.5	34
July 3	52.5	48	41	Sept. 18	52	52	50	June 1	45	47	31
July 4	53	48	48	Sept. 19	52	52	50	June 2	45	46.5	30
July 5	53	48	40	Sept. 20	52	52	50	June 3	48	47	40
July 6	54	48.5	40	Sept. 21	52	52	43	June 4	48	47	41
July 7	54	48.5	49	Sept. 22	50	52	38	June 5	51	47.5	41
July 8	54	48.5	49	Sept. 23	50	51.5	45	June 6	50	47.5	42
July 9	54.5	49	49	Sept. 24	50	51.5	43	June 7	49.5	48.5	40
July 10	55	49	49	Sept. 25	50	51	45	June 8	50	48.5	44
July 11	54.5	49.5	49	Sept. 26	50	51	42	June 9	50	48.5	42
July 12	55	50	49	Sept. 27	50	51	41	June 10	50.5	48.5	42
July 13	55	50	49	Sept. 28	50	51	38	June 11	50.5	48.5	35
July 14	55	50	44	Sept. 29	50	51	42	June 12	50	49	34
July 15	55	50	44	Sept. 30	50	50.5	38	June 13	53	49.5	38
July 16	55.5	50.5	44	Oct. 1	49	50.5	32	June 14	55	50	42
July 17	56	51	50	Oct. 2	49	50.5	45	June 15	55.5	50.5	48
July 18	56	51.5	54	Oct. 3	49	50	38	June 16	55	51	43
July 19	55	51.5	43	Oct. 4	50	50	45	June 17	54.5	50.5	42
July 20	55	51.5	52	Oct. 5	50	50	45	June 18	54.5	51.5	44
July 21	56	51.5	50	Oct. 6	49	50	38	June 19	54.5	51.5	48
July 22	56	51.5	52	Oct. 7	48.5	50	40	June 20	55	51.5	47
July 23	57.5	51.5	51	Oct. 8	47.5	49.5	34	June 21	54.5	51.5	46
July 24	57	52	53	Oct. 9	46	49	30	June 22	52.5	51.5	44
July 25	57	52.5	50	Oct. 10	44	49	30	June 23	54	51.5	46
July 26	57	52.5	49	Oct. 11	43	48.5	25	June 24	55.5	51.5	40
July 27	59	52.5	49	Oct. 12	42.5	48	24	June 25	58.5	52	45
July 28	60	53	51	Oct. 13	43	48	29	June 26	58.5	53	50
July 29	60	53	49	Oct. 14	45	48	40	June 27	58.5	53	44
July 30	60	53.5	50	Oct. 15	46	45.5	39	June 28	58.5	53	42
July 31	61	53.5	50	Oct. 16	46	47	38	June 29	58	53.5	44
Aug. 1	59	54	52	Oct. 17	46	46	38	June 30	60	54	42
Aug. 2	58	54	50	Oct. 18	42.5	45	27	July 1	63	54.5	52
Aug. 3	58.5	54	53	Oct. 19	42	45	28	July 2	59	54.5	50

Soil temperatures—Continued.

SITKA EXPERIMENT STATION—Continued.

Day.	6-inch thermometer.	24-inch thermometer.	Radiation thermometer.	Day.	6-inch thermometer.	24-inch thermometer.	Radiation thermometer.	Day.	6-inch thermometer.	24-inch thermometer.	Radiation thermometer.
1900.	°F.	°F.	°F.	1900.	°F.	°F.	°F.	1901.	°F.	°F.	°F.
July 3	60	54.5	49	Sept. 19	.....	.....	.....	Apr. 6	39	42.5	28
July 4	59.5	54.5	50	Sept. 20	.....	.....	.....	Apr. 7	39	42.5	33
July 5	55.5	54	40	Sept. 21	.....	.....	.....	Apr. 8	39	42.5	36
July 6	57	54	42	Sept. 22	.....	.....	.....	Apr. 9	39	42.5	30
July 7	57.5	54	42	Sept. 23	51	53	33	Apr. 10	39	42.5	31
July 8	59	54.5	46	Sept. 24	51	53	36	Apr. 11	36.5	42	29
July 9	61	55	52	Sept. 25	.....	.....	.....	Apr. 12	36.5	42	29
July 10	58	55	40	Sept. 26	.....	.....	.....	Apr. 13	38.5	41.5	32
July 11	58.5	55	42	Sept. 27	.....	.....	.....	Apr. 14	39.5	41.5	31
July 12	60.5	55	47	Sept. 28	51.5	53	43	Apr. 15	40	42	33
July 13	59	55	50	Sept. 29	50	52	31	Apr. 16	39.5	41	33
July 14	59	55	49	Sept. 30	49	52	36	Apr. 17	39.5	40	33
July 15	58	55	50	Oct. 1	47.5	52	26	Apr. 18	40.5	41	32
July 16	59	55	50	Oct. 2	47	51	33	Apr. 19	42	41.5	38
July 17	57	55	51	Oct. 3	45	50	30	Apr. 20	42	41.5	34
July 18	58	55	50	Oct. 4	44	50	24	Apr. 21	44	42.5	35
July 19	56.5	54.5	51	Oct. 5	44	49	24	Apr. 22	44	43	34
July 20	55	54.5	41	Oct. 6	44.5	49	34	Apr. 23	44.5	43	34
July 21	57	54.5	46	Oct. 7	47	49	42	Apr. 24	45	44	34
July 22	57	54.5	52	Oct. 8	49.5	49	42	Apr. 25	45.5	44.5	36
July 23	57.5	54.5	52	Oct. 9	49	49	39	Apr. 26	45.5	44.5	33
July 24	58	54.5	44	Oct. 10	49	49	38	Apr. 27	46	45	41
July 25	59.5	55	49	Oct. 11	48.5	49.5	38	Apr. 28	46.5	45.5	32
July 26	58	55.5	52	Oct. 12	46.5	49	26	Apr. 29	46.5	45.5	32
July 27	58	55.5	52	Oct. 13	45.5	48	33	Apr. 30	46	45.5	37
July 28	58.5	55.5	44	Oct. 14	46	47.5	37	May 1	42	46	31
July 29	57.5	55.5	49	Oct. 15	46	47.5	33	May 2	40	46	31
July 30	57	55.5	46	Oct. 16	46	48	35	May 3	42	46	33
July 31	57	55	45	Oct. 17	45	48.5	38	May 4	44	45.5	33
Aug. 1	57	55	42	Oct. 18	44.5	48	42	May 5	44	45.5	37
Aug. 2	57.5	55	51	Oct. 19	43	48	33	May 6	45	45.5	42
Aug. 3	58	55	52	Oct. 20	41	47.5	29	May 7	45	46	35
Aug. 4	59	55.5	51	Oct. 21	41	47.5	29	May 8	45	46	31
Aug. 5	58.5	55.5	49	Oct. 22	40.5	46.5	20	May 9	46.5	46	37
Aug. 6	57.5	55.5	45	Oct. 23	40	45	26	May 10	47	46.5	34
Aug. 7	58	55.5	51	Oct. 24	39.5	44.5	33	May 11	46.5	46.5	40
Aug. 8	58.5	55.5	48	Oct. 25	39.5	44.5	33	May 12	44.5	47	37
Aug. 9	60	55.5	49	Oct. 26	39.5	44.5	32	May 13	45	47	36
Aug. 10	60.5	56	54	Oct. 27	39.5	44.5	34	May 14	45.5	47	34
Aug. 11	59	56	44	Oct. 28	39	44.5	32	May 15	46.5	47	41
Aug. 12	57.5	56	42	Oct. 29	39	44	30	May 16	47	47	38
Aug. 13	58	56	50	Oct. 30	39	44	32	May 17	47.5	47.5	40
Aug. 14	56	55.5	49	Oct. 31	39	44	30	May 18	49	47.5	34
Aug. 15	54	55.5	41	Nov. 1	39	44	31	May 19	50	48	35
Aug. 16	57	55	45	Nov. 2	38	43.5	20	May 20	51.5	48	35
Aug. 17	56	55	47	Nov. 3	38	42.5	22	May 21	51	48.5	37
Aug. 18	56.5	55	47	Nov. 4	38	42.5	34	May 22	52	49	40
Aug. 19	57	55	50	Nov. 5	39	42.5	33	May 23	51	49.5	43
Aug. 20	57.5	55	52	Nov. 6	39.5	43	40	May 24	50	50	32
Aug. 21	57.5	55	44	Nov. 7	40.5	43.5	35	May 25	49.5	50	37
Aug. 22	58	55.5	54	Nov. 8	41.5	43.5	31	May 26	48	50	38
Aug. 23	57.5	55.5	53	Nov. 9	42	43.5	34	May 27	48.5	50	38
Aug. 24	56.5	55.5	38	Nov. 10	42	43.5	36	May 28	49	50	33
Aug. 25	56	55	32	Nov. 11	41	43.5	30	May 29	49	50	38
Aug. 26	55	55	40	Nov. 12	38	43	24	May 30	49	50	37
Aug. 27	55	54.5	43	Nov. 13	37	42.5	28	May 31	50	50.5	33
Aug. 28	55	54.5	50	Nov. 14	36	42	25	June 1	50.5	50.5	35
Aug. 29	56	54.5	50	Nov. 15	36	41.5	18	June 2	51	51	39
Aug. 30	56	54.5	47	Nov. 16	.....	.....	.....	June 3	51	51	35
Aug. 31	56	54.5	47	Nov. 17	.....	.....	.....	June 4	50.5	51.5	41
Sept. 1	55.5	54.5	47	Nov. 18	.....	.....	.....	June 5	51.5	51.5	44
Sept. 2	55.5	54.5	47	Nov. 19	.....	.....	.....	June 6	52.5	51.5	40
Sept. 3	55	54.5	39	Nov. 20	.....	.....	.....	June 7	53.5	52	45
Sept. 4	54	54.5	41	Nov. 21	.....	.....	.....	June 8	53	52	45
Sept. 5	54	54.5	40	Nov. 22	.....	.....	.....	June 9	53	52.5	39
Sept. 6	54	54.5	40	Nov. 23	.....	.....	.....	June 10	52	52.5	39
Sept. 7	54	54	39	Nov. 24	.....	.....	.....	June 11	53.5	53.5	45
Sept. 8	54.5	54	49	Nov. 25	.....	.....	.....	June 12	53	52.5	47
Sept. 9	54.5	54	49	Nov. 26	.....	.....	.....	June 13	52	53	43
Sept. 10	55	54	52	Nov. 27	.....	.....	.....	June 14	52.5	53	44
Sept. 11	55.5	54	45	Nov. 28	.....	.....	.....	June 15	53	53	44
Sept. 12	55	54	42	Nov. 29	.....	.....	.....	June 16	54	53	48
Sept. 13	52.5	54	32	Nov. 30	.....	.....	.....	June 17	54.5	53.5	49
Sept. 14	52.5	54	32					June 18	54	53	43
Sept. 15	52	53.5	33	1901.				June 19	54	54	44
Sept. 16	51.5	53	38	Apr. 3	39	42	32	June 20	54	54	45
Sept. 17	53	53	43	Apr. 4	39	42.5	29	June 21	54.5	54	46
Sept. 18	53.5	53	48	Apr. 5	39	42.5	25	June 22	55.5	54.5	49

Soil temperatures—Continued.

SITKA EXPERIMENT STATION—Continued.

Day.	6-inch thermometer.	24-inch thermometer.	Radiation thermometer.	Day.	6-inch thermometer.	24-inch thermometer.	Radiation thermometer.	Day.	6-inch thermometer.	24-inch thermometer.	Radiation thermometer.
1901.	°F.	°F.	°F.	1901.	°F.	°F.	°F.	1901.	°F.	°F.	°F.
June 23	55	54.5	47	Aug. 7	57.5	59.5	46	Sept. 20	54	57	46
June 24	55	54.5	49	Aug. 8	57.5	59.5	50	Sept. 21	54	57	37
June 25	57	55	48	Aug. 9	56.5	59.5	50	Sept. 22	52.5	57	37
June 26	56.5	55	45	Aug. 10	56.5	59.5	50	Sept. 23	53	57	45
June 27	56.5	55.5	45	Aug. 11	56.5	59.5	51	Sept. 24	53	57	39
June 28	55	55.5	45	Aug. 12	56.5	59.5	50	Sept. 25	53	56.5	37
June 29	54	55.5	46	Aug. 13	56.5	59.5	50	Sept. 26	52	56.5	43
June 30	54.5	55.5	47	Aug. 14	57	59	51	Sept. 27	51.5	56.5	36
July 1	54	55.5	45	Aug. 15	57	59	46	Sept. 28	51	57	36
July 2	55	55.5	45	Aug. 16	57	59	48	Sept. 29	51	56	44
July 3	56.5	55.5	45	Aug. 17	57	59	48	Sept. 30	50	55.5	44
July 4	55.5	55.5	49	Aug. 18	56	59	47	Oct. 1	52	53.5	47
July 5	56.5	56	48	Aug. 19	56	59	50	Oct. 2	52	54	45
July 6	58	56	50	Aug. 20	56	59	49	Oct. 3	52	54	41
July 7	56	56.5	46	Aug. 21	56	59	50	Oct. 4	52	54	45
July 8	55.5	56.5	46	Aug. 22	57	59	52	Oct. 5	52	54	45
July 9	55	56.5	44	Aug. 23	57.5	59	52	Oct. 6	52	54	46
July 10	56.5	56.5	48	Aug. 24	58	59	52	Oct. 7	51.5	54	44
July 11	56.5	56.5	43	Aug. 25	59	59	50	Oct. 8	51.5	53.5	45
July 12	57	56.5	56	Aug. 26	59	59.5	52	Oct. 9	51.5	53.5	43
July 13	57.5	56.5	48	Aug. 27	58.5	59.5	52	Oct. 10	51.5	53	42
July 14	56.5	56.5	48	Aug. 28	57	60	56	Oct. 11	51.5	53	44
July 15	58	57	52	Aug. 29	57	60	54	Oct. 12	51.5	52.5	44
July 16	59.5	57.5	49	Aug. 30	56	59.5	50	Oct. 13	50	52.5	38
July 17	59	58	52	Aug. 31	56	60	57	Oct. 14	48	52.5	31
July 18	58.5	58	45	Sept. 1	55.5	59.5	48	Oct. 15	48	52.5	40
July 19	60	58	51	Sept. 2	55	59.5	48	Oct. 16	49	52	42
July 20	59	58.5	47	Sept. 3	54.5	59	45	Oct. 17	49	52	33
July 21	58.5	58.5	45	Sept. 4	53.5	59	44	Oct. 18	48.5	51.5	44
July 22	60	59	53	Sept. 5	54	58.5	47	Oct. 19	48.5	51.5	45
July 23	59.5	59	49	Sept. 6	54	58.5	50	Oct. 20	48	51	43
July 24	59.5	59	46	Sept. 7	55	58.5	45	Oct. 21	48	51	41
July 25	60	59.5	53	Sept. 8	56	58.5	50	Oct. 22	47	51	40
July 26	60	59.5	52	Sept. 9	57	58.5	48	Oct. 23	46.5	51	38
July 27	60	59.5	49	Sept. 10	57	58.5	49	Oct. 24	46.5	51	31
July 28	60.5	60	50	Sept. 11	57	58.5	50	Oct. 25	46.5	50.5	38
July 29	61.5	60	49	Sept. 12	57	58.5	49	Oct. 26	46	50	41
July 30	62	60	52	Sept. 13	55.5	5.85	44	Oct. 27	46	50	38
Aug. 1	59	60.5	51	Sept. 14	53.5	58.5	45	Oct. 28	45.5	49.5	36
Aug. 2	58	60.5	49	Sept. 15	53	58	44	Oct. 29	44.5	49	36
Aug. 3	58	60.5	50	Sept. 16	53	57.5	48	Oct. 30	44	49	33
Aug. 4	57	60	49	Sept. 17	53.5	57.5	48	Oct. 31	43	49	33
Aug. 5	58	60	50	Sept. 18	54.5	57.5	46				
Aug. 6	58	60	51	Sept. 19	54.5	57.5	50				

KENAI EXPERIMENT STATION.

1899.	°F.	°F.	°F.	1899.	°F.	°F.	°F.	1899.	°F.	°F.	°F.
May 1	.....	.....	.....	May 28	41	32	.....	June 24	52	42	.....
May 2	.....	.....	.....	May 29	38.5	32	.....	June 25	51.5	42	.....
May 3	.....	.....	.....	May 30	38	32	.....	June 26	53	42.5	.....
May 4	.....	.....	.....	May 31	38.5	32	.....	June 27	52	43.5	.....
May 5	.....	.....	.....	June 1	38	32	.....	June 28	52	44	.....
May 6	.....	.....	.....	June 2	38	32	.....	June 29	51	44	.....
May 7	.....	.....	.....	June 3	39	32	.....	June 30	52	44.5	.....
May 8	.....	.....	.....	June 4	39.5	32	.....	July 1	54	45	.....
May 9	.....	.....	.....	June 5	41	32	.....	July 2	53	45.5	.....
May 10	36	.....	.....	June 6	42	32	.....	July 3	52.5	45.5	.....
May 11	35	.....	.....	June 7	41	32	.....	July 4	52.5	47	.....
May 12	36	.....	.....	June 8	41.5	32	.....	July 5	54	46	.....
May 13	36	.....	.....	June 9	41.5	32	.....	July 6	54.5	46.5	.....
May 14	35	.....	.....	June 10	43	32	.....	July 7	57	47	.....
May 15	36	.....	.....	June 11	42	32	.....	July 8	58	47.5	.....
May 16	36	.....	.....	June 12	45.5	32	.....	July 9	58	48.5	.....
May 17	36.5	.....	.....	June 13	45	32	.....	July 10	58	48.5	.....
May 18	36.5	.....	.....	June 14	44.5	32	.....	July 11	57	49	.....
May 19	36	.....	.....	June 15	45	32.5	.....	July 12	53.5	49	.....
May 20	38	.....	.....	June 16	47	32.5	.....	July 13	52.5	49	.....
May 21	39.5	.....	.....	June 17	48.5	33	.....	July 14	50	49	.....
May 22	39	.....	.....	June 18	48.5	35	.....	July 15	55	49	.....
May 23	39	.....	.....	June 19	48	37.5	.....	July 16	55	49	.....
May 24	39	.....	.....	June 20	47.5	37.5	.....	July 17	59	50	.....
May 25	39	.....	.....	June 21	44.5	39.5	.....	July 18	59	50	.....
May 26	39	.....	.....	June 22	50	40.5	.....	July 19	56	50	.....
May 27	41	.....	.....	June 23	50	41	.....	July 20	56	50	.....

Soil temperatures—Continued.

KENAI EXPERIMENT STATION—Continued.

Day.	6-inch thermometer.	24-inch thermometer.	Radiation thermometer.	Day.	6-inch thermometer.	24-inch thermometer.	Radiation thermometer.	Day.	6-inch thermometer.	24-inch thermometer.	Radiation thermometer.
1899.	°F.	°F.	°F.	1899.	°F.	°F.	°F.	1901.	°F.	°F.	°F.
July 21	57.5	50	.....	Oct. 4	40.5	43.5	.....	Aug. 10	53	51	.....
July 22	57.5	50	.....	Oct. 5	41.5	43.5	.....	Aug. 11	52	51	.....
July 23	58	50.5	.....	Oct. 6	39.5	43	.....	Aug. 12	53.5	51	.....
July 24	55	50	.....	Oct. 7	38.5	43	.....	Aug. 13	54	51	.....
July 25	56	50	.....	Oct. 8	38.5	43	.....	Aug. 14	55.5	50.5	.....
July 26	56	50	.....	Oct. 9	37.5	42.5	.....	Aug. 15	55	50	.....
July 27	57	50	.....	Oct. 10	37.5	42.5	.....	Aug. 16	54	50.5	.....
July 28	58	50.5	.....	Oct. 11	37	42	.....	Aug. 17	54	50.5	.....
July 29	58	50.5	.....	Oct. 12	38.5	41.5	.....	Aug. 18	53	50.5	.....
July 30	59	51.5	.....	Oct. 13	40	41.5	.....	Aug. 19	54	50.5	.....
July 31	59	51.5	.....	Oct. 14	38.5	41.5	.....	Aug. 20	53	50.5	.....
Aug. 1	58.5	52	.....	Oct. 15	39.5	41.5	.....	Aug. 21	53.5	50	.....
Aug. 2	57	52	.....	Oct. 16	39.5	41.5	.....	Aug. 22	54.5	50.5	.....
Aug. 3	55	52	.....	Oct. 17	38.5	41	.....	Aug. 23	54.5	50.5	.....
Aug. 4	55	51.5	.....	Oct. 18	36	41	.....	Aug. 24	54	50.5	.....
Aug. 5	54.5	51.5	.....	Oct. 19	35	40	.....	Aug. 25	54.5	50.5	.....
Aug. 6	54	51.5	.....	Oct. 20	.....	.....	.....	Aug. 26	53.5	50.5	.....
Aug. 7	55	51	.....	Oct. 21	.....	.....	.....	Aug. 27	53	50.5	.....
Aug. 8	55	51	.....	Oct. 22	.....	.....	.....	Aug. 28	53	50.5	.....
Aug. 9	55	51	.....	Oct. 23	.....	.....	.....	Aug. 29	53.5	50	.....
Aug. 10	56	51	.....	Oct. 24	.....	.....	.....	Aug. 30	53.5	50	.....
Aug. 11	55.5	51.5	.....	Oct. 25	.....	.....	.....	Aug. 31	53	50	.....
Aug. 12	54.5	51.5	.....	Oct. 26	.....	.....	.....	Sept. 1	51.5	50	.....
Aug. 13	56	51.5	.....	Oct. 27	.....	.....	.....	Sept. 2	52	50	.....
Aug. 14	54	51.5	.....	Oct. 28	.....	.....	.....	Sept. 3	50.5	49.5	.....
Aug. 15	54	51.5	.....	Oct. 29	.....	.....	.....	Sept. 4	49	49.5	.....
Aug. 16	54	51.5	.....					Sept. 5	51	49	.....
Aug. 17	53	51.5	.....	1901.				Sept. 6	50.5	49	.....
Aug. 18	52.5	51	.....	June 24	49	.....	.....	Sept. 7	50	49	.....
Aug. 19	53	51	.....	June 25	49	.....	.....	Sept. 8	51.5	49	.....
Aug. 20	54	51	.....	June 26	49.5	.....	.....	Sept. 9	48	49	.....
Aug. 21	53	51	.....	June 27	51	.....	.....	Sept. 10	49.5	48.5	.....
Aug. 22	51	50.5	.....	June 28	51.5	.....	.....	Sept. 11	51.5	48.5	.....
Aug. 23	53	50.5	.....	June 29	52.5	.....	.....	Sept. 12	50.5	48.5	.....
Aug. 24	52.5	50.5	.....	June 30	53	.....	.....	Sept. 13	51	48.5	.....
Aug. 25	51.5	50.5	.....	July 1	54.5	.....	.....	Sept. 14	50.5	48.5	.....
Aug. 26	51.5	50	.....	July 2	54	.....	.....	Sept. 15	48	48.5	.....
Aug. 27	52	50	.....	July 3	55	.....	.....	Sept. 16	48	48.5	.....
Aug. 28	52	50	.....	July 4	51	.....	.....	Sept. 17	48	48	.....
Aug. 29	52	50	.....	July 5	52	.....	.....	Sept. 18	47.5	47.5	.....
Aug. 30	52	50	.....	July 6	51.5	.....	.....	Sept. 19	48	47.5	.....
Aug. 31	52.5	50	.....	July 7	52.5	.....	.....	Sept. 20	49	47.5	.....
Sept. 1	52.5	50	.....	July 8	54.5	.....	.....	Sept. 21	50	47.5	.....
Sept. 2	51.5	50	.....	July 9	53.5	.....	.....	Sept. 22	49.5	47.5	.....
Sept. 3	51	50	.....	July 10	54.5	.....	.....	Sept. 23	46	47.5	.....
Sept. 4	52	50	.....	July 11	54.5	.....	.....	Sept. 24	46	47	.....
Sept. 5	52	50	.....	July 12	54.5	.....	.....	Sept. 25	44.5	46.5	.....
Sept. 6	51.5	50	.....	July 13	54	.....	.....	Sept. 26	43	46.5	.....
Sept. 7	51.5	50	.....	July 14	54	.....	.....	Sept. 27	42	46	.....
Sept. 8	51	50	.....	July 15	56	.....	.....	Sept. 28	44	45.5	.....
Sept. 9	52	50	.....	July 16	56	.....	.....	Sept. 29	44	45.5	.....
Sept. 10	51.5	50	.....	July 17	56.5	.....	.....	Sept. 30	43	45	.....
Sept. 11	51	50	.....	July 18	56.5	.....	.....	Oct. 1	41.5	45	.....
Sept. 12	51.5	49	.....	July 19	56.5	.....	.....	Oct. 2	43.5	44.5	.....
Sept. 13	49	49.5	.....	July 20	58	.....	.....	Oct. 3	45	44.5	.....
Sept. 14	49.5	49.5	.....	July 21	58	.....	.....	Oct. 4	46	44.5	.....
Sept. 15	49	49	.....	July 22	.....	.....	.....	Oct. 5	44	44.5	.....
Sept. 16	49.5	49	.....	July 23	57.5	.....	.....	Oct. 6	45	44.5	.....
Sept. 17	49	49	.....	July 24	57.5	.....	.....	Oct. 7	44	44.5	.....
Sept. 18	49	48.5	.....	July 25	57	50.5	.....	Oct. 8	44	44.5	.....
Sept. 19	45.5	48.5	.....	July 26	56.5	50.5	.....	Oct. 9	44	44.5	.....
Sept. 20	46	48	.....	July 27	57.5	50.5	.....	Oct. 10	43	44	.....
Sept. 21	42.5	47.5	.....	July 28	58.5	50.5	.....	Oct. 11	41	44	.....
Sept. 22	42.5	47	.....	July 29	59	51	.....	Oct. 12	41	43.5	.....
Sept. 23	41.5	47	.....	July 30	59	51	.....	Oct. 13	37.5	43	.....
Sept. 24	41	46	.....	July 31	59	51	.....	Oct. 14	39	43	.....
Sept. 25	40	45.5	.....	Aug. 1	58	51	.....	Oct. 15	40	42.5	.....
Sept. 26	42	45.5	.....	Aug. 2	58.5	51.5	.....	Oct. 16	39	42.5	.....
Sept. 27	43	45	.....	Aug. 3	58.5	51.5	.....	Oct. 17	37	42	.....
Sept. 28	.....	.....	.....	Aug. 4	57	51.5	.....	Oct. 18	36	42	.....
Sept. 29	44	45	.....	Aug. 5	56.5	51.5	.....	Oct. 19	37	41.5	.....
Sept. 30	41	45	.....	Aug. 6	57.5	51.5	.....	Oct. 20	39	41	.....
Oct. 1	39.5	45	.....	Aug. 7	56.5	51.5	.....	Oct. 21	39	41	.....
Oct. 2	39	44	.....	Aug. 8	57	52	.....	Oct. 22	38	41	.....
Oct. 3	39.5	44	.....	Aug. 9	54.5	51.5	.....	Oct. 23	38	41	.....

Soil temperatures—Continued.

EAGLE, ALASKA. U. G. Myers, Observer.

Day.	6-inch thermometer.	24-inch thermometer.	Radiation thermometer.	Day.	6-inch thermometer.	24-inch thermometer.	Radiation thermometer.	Day.	6-inch thermometer.	24-inch thermometer.	Radiation thermometer.
1900.	°F.	°F.	°F.	1900.	°F.	°F.	°F.	1901.	°F.	°F.	°F.
June 1	.....	.....	.....	July 29	56	50.5	48	June 4	40	32.5	30.2
June 2	.....	.....	.....	July 30	53.5	50.5	31	June 5	40.5	32.5	29.3
June 3	.....	.....	.....	July 31	53.5	50.5	29	June 6	42.5	32.5	42.1
June 4	46	48.5	27	Aug. 1	53.5	50.5	29	June 7	40.5	33	31.6
June 5	48	39	31	Aug. 2	54.5	50.5	34	June 8	38	33	26.6
June 6	48.5	39.5	33	Aug. 3	53.5	50.5	32	June 9	40	33	40
June 7	48.5	40.5	29	Aug. 4	55	50.5	46	June 10	40.5	33	30.8
June 8	48	40.5	37	Aug. 5	54	50.5	42	June 11	44	33.5	40
June 9	45	40.5	25	Aug. 6	52	50.5	31	June 12	43	34	32
June 10	47	40.5	32	Aug. 7	52	50	40	June 13	44.5	34.5	33.2
June 11	45	40.5	27	Aug. 8	53.5	50	38	June 14	45	35	40
June 12	46	40.5	40	Aug. 9	54.5	50.5	39	June 15	44	35.5	30
June 13	51	40.5	45	Aug. 10	54	50.5	41	June 16	46.5	36	38
June 14	48.5	40.5	38	Aug. 11	53	50.5	42	June 17	48	37	44.2
June 15	46.5	41.5	34	Aug. 12	50	50.5	28	June 18	48.5	38	37
June 16	49	41.5	38	Aug. 13	52	50	39	June 19	48.5	38.5	45
June 17	49	41.5	33	Aug. 14	50	49.5	45	June 20	51.5	39.5	52
June 18	46	41.5	31	Aug. 15	49	49.5	28	June 21	52	40.5	43.4
June 19	49	41.5	42	Aug. 16	49	49	37	June 22	52.5	41	43.2
June 20	49	41.5	39	Aug. 17	49.5	48.5	34	June 23	52	42	43
June 21	49	42	42	Aug. 18	50.5	48.5	41	June 24	52.5	42.5	35
June 22	49.5	42	40	Aug. 19	48.5	48.5	44	June 25	54	43	46
June 23	49.5	42.5	34	Aug. 20	49	48.5	29	June 26	52	43	33
June 24	51.5	42.5	44	Aug. 21	48.5	48.5	39	June 27	52	43	36
June 25	51.5	43	45	Aug. 22	46	48.5	35	June 28	53	43.5	35
June 26	54	43.5	53	Aug. 23	45	48	29	June 29	55	44	50
June 27	58.5	44	55	Aug. 24	46.5	47.5	26	June 30	52.5	44	47
June 28	58.5	45.5	46	Aug. 25	47.5	47	34	July 1	49	43.5	44.2
June 29	58	47	47	Aug. 26	43	47	39	July 2	50	43	36
June 30	57.5	47.5	40	Aug. 27	42	47	30	July 3	51.5	43	43
July 1	60	48.5	48	Aug. 28	43.5	46	26	July 4	52.5	43	42
July 2	59	49	43	Aug. 29	44	45.5	33	July 5	51.5	43.5	41
July 3	58.5	49	44	Aug. 30	44.5	45.5	39	July 6	52.5	43.5	38.9
July 4	56.5	49	43	Aug. 31	44.5	45	42	July 7	54.5	44	41
July 5	56	49	39					July 8	54.5	44.5	46.4
July 6	55	49	37	1901.				July 9	53.5	45	36
July 7	55.5	49	40	May 13	32	18	.....	July 10	55.5	45	53.5
July 8	55	48.5	42	May 14	32	19	.....	July 11	53.5	45.5	37
July 9	54	48.5	37	May 15	32	18	.....	July 12	53.5	45.5	39
July 10	54	48	42	May 16	32.5	20.5	.....	July 13	54.5	45.5	41
July 11	51	48	38	May 17	33	34.5	.....	July 14	55	46	51
July 12	51.5	47.5	32	May 18	32.5	24.5	.....	July 15	55	46	50.8
July 13	53.5	47.5	36	May 19	33.5	26.3	.....	July 16	55	46	52
July 14	53.5	47.5	35	May 20	34	20	.....	July 17	53	46	49
July 15	54	48.5	35	May 21	35	23.2	.....	July 18	53	46	43
July 16	57	49	46	May 22	36	24.4	.....	July 19	53	46	35
July 17	59	49	35	May 23	39	37	.....	July 20	54.5	46	49.8
July 18	55.5	49.5	37	May 24	36.5	25	.....	July 21	53.5	46	40.5
July 19	53.5	49.5	46	May 25	40.5	37	.....	July 22	53	46.5	37.9
July 20	52.5	49	41	May 26	40	34	.....	July 23	53.5	46.5	33.1
July 21	52	48.5	32	May 27	37.5	35	.....	July 24	54	46.5	33.5
July 22	52	48.5	36	May 28	38	30.4	.....	July 25	54	47	34.1
July 23	52.5	48.5	42	May 29	38.5	30.5	.....	July 26	54	47	37
July 24	56	48.5	47	May 30	38.5	29.5	.....	July 27	54	47	39
July 25	54.5	49	38	May 31	38.5	30	.....	July 28	54	47.5	44
July 26	55.5	49.5	43	June 1	39	32	34	July 29	54	47.5	44.8
July 27	57.5	50	45	June 2	38.5	32	24.5	July 30	52	47.5	41.3
July 28	57.5	50.5	50	June 3	37.5	32	23.3	July 31	52	47.5	35

FORT YUKON. Rev. L. J. H. Wooden, Observer.

1900.	°F.	°F.	°F.	1900.	°F.	°F.	°F.	1900.	°F.	°F.	°F.
June 1	45	31	37	June 14	43	32	29	June 27	56	36	50
June 2	46	31	42	June 15	43	32	28	June 28	58	37	54
June 3	46	31	47	June 16	43	32	43	June 29	59	37	56
June 4	47	31	44	June 17	45	32	45	June 30	59	38	59
June 5	47	31	46	June 18	46	32	47	July 1	.....	.....	.....
June 6	46	31	45	June 19	47	32	44	July 2	.....	.....	.....
June 7	43	31	41	June 20	47	32	46	July 3	.....	.....	.....
June 8	40	31	36	June 21	46	32	41	July 4	.....	.....	.....
June 9	40	31	41	June 22	47	33	43	July 5	.....	.....	.....
June 10	41	32	36	June 23	51	33	51	July 6	53	40	51
June 11	43	32	42	June 24	51	33	50	July 7	53	41	.....
June 12	45	32	44	June 25	54	34	47	July 8	52	40	40
June 13	46	32	.....	June 26	56	35	55	July 9	53	40	40

Soil temperatures—Continued.

FORT YUKON—Continued.

Day.	6-inch thermometer.	24-inch thermometer.	Radiation thermometer.	Day.	6-inch thermometer.	24-inch thermometer.	Radiation thermometer.	Day.	6-inch thermometer.	24-inch thermometer.	Radiation thermometer.
1900.	°F.	°F.	°F.	1900.	°F.	°F.	°F.	1900.	°F.	°F.	°F.
July 10	54	40	44	July 28	55	43	50	Aug. 15	48	41	35
July 11	54	40	43	July 29	54	42	45	Aug. 16	48	41	45
July 12	56	40	40	July 30	55	42	38	Aug. 17	48	41	42
July 13	53	41	46	July 31	56	42	47	Aug. 18	48	40	44
July 14	58	41	46	Aug. 1	56	43	47	Aug. 19	48	40	45
July 15	59	42	56	Aug. 2	57	43	49	Aug. 20	48	40	34
July 16	58	43	49	Aug. 3	56	43	57	Aug. 21	48	40	44
July 17	59	43	-------	Aug. 4	54	43	53	Aug. 22	46	40	38
July 18	53	43	50	Aug. 5	53	43	48	Aug. 23	46	40	31
July 19	54	43	52	Aug. 6	52	43	50	Aug. 24	46	39	32
July 20	54	43	52	Aug. 7	52	43	47	Aug. 25	47	39	42
July 21	53	42	48	Aug. 8	55	42	55	Aug. 26	41	39	28
July 22	55	41	45	Aug. 9	56	42	54	Aug. 27	38	39	23
July 23	56	42	46	Aug. 10	53	43	53	Aug. 28	38	37	31
July 24	55	42	54	Aug. 11	52	42	45	Aug. 29	39	37	34
July 25	55	45	48	Aug. 12	52	42	45	Aug. 30	-------	-------	-------
July 26	56	42	50	Aug. 13	51	42	46	Aug. 31	43	36	31
July 27	56	42	49	Aug. 14	50	42	39				

HOLY CROSS MISSION.

1901.	°F.	°F.	°F.	1901.	°F.	°F.	°F.	1901.	°F.	°F.	°F.
June 6	35	32	35	July 5	46.5	33	38	Aug. 3	51	40	41.5
June 7	37.5	32	36	July 6	45	33.5	34	Aug. 4	50	40	41.5
June 8	37	31.5	38	July 7	47	34	35	Aug. 5	51	40	49.5
June 9	38	31.5	38	July 8	47	34	36	Aug. 6	50	40	50
June 10	40	32	35.5	July 9	48.5	34.5	47.5	Aug. 7	49.5	40	46
June 11	41.5	32	42	July 10	46.5	34.5	45	Aug. 8	45.5	40	32
June 12	40.5	32	37.5	July 11	48	34.5	48	Aug. 9	44	40	37
June 13	42.5	32	37	July 12	49	35	50	Aug. 10	43	39.5	35.5
June 14	44	32	40	July 13	49	35	48	Aug. 11	44	39.5	36
June 15	45.5	32	45.5	July 14	47.5	35.5	45.5	Aug. 12	45	39.5	37.5
June 16	45.5	32	45.5	July 15	47.5	36	40	Aug. 13	45	40	32.5
June 17	44	32	35.5	July 16	48	36	44	Aug. 14	48	40	40
June 18	46	32	44	July 17	49	36.5	44	Aug. 15	47	40	38
June 19	47	32	49	July 18	50	36.5	42	Aug. 16	48	40	37
June 20	50	32	49	July 19	50	36.5	40	Aug. 17	49	40	34
June 21	47.5	32	48	July 20	51	37	41.5	Aug. 18	47	40	32
June 22	49	32	50	July 21	58	38	52	Aug. 19	44	40	40
June 23	46.5	32	41	July 22	57	38.5	50	Aug. 20	47	40	41
June 24	48.5	32	44.5	July 23	56.5	39	48	Aug. 21	48	40	47.5
June 25	44.5	32	45.5	July 24	57	40	53	Aug. 22	48	40	46
June 26	45.5	32	47	July 25	56	40	44	Aug. 23	49.5	40	46
June 27	45	32.5	37.5	July 26	56	40.5	49	Aug. 24	48.5	41	38
June 28	47.5	32.5	44	July 27	52.5	41	47	Aug. 25	46.5	41	40
June 29	44	32	35.5	July 28	50	40.5	47	Aug. 26	46.5	41	40
June 30	43.5	32	37.5	July 29	50	40.5	45	Aug. 27	46	41	37
July 1	44	32.5	36	July 30	49	40.5	39	Aug. 28	45.5	40.5	35
July 2	47.5	32.5	47.5	July 31	49	40	32	Aug. 29	45	40.5	37
July 3	48	33	41	Aug. 1	47	40	30	Aug. 30	43	40	30
July 4	46.5	33	44	Aug. 2	50	40	39.5	Aug. 31	42	40	24

WEATHER SERVICE.

As in the past, I have also, during the period covered by this report, had supervision of the volunteer weather service on the coast, and I submit herewith condensed monthly data from the reports rendered. They indicate for each month the maximum and minimum temperatures, the daily mean temperatures, the total precipitation in inches, and the conditions of the weather as to cloudiness. The temperatures are given in degrees Fahrenheit.

The Chief of the Weather Bureau has informed me that the regular Weather Bureau station at Eagle, which was in charge of a section director of that Bureau, has been discontinued and that the stations in the interior have been directed to send their reports to me in the future.

Meteorological observations.

SITKA. F. E. Rader, Observer.

Month.	Temperature.			Total precipitation.	Weather conditions (number of days).			
	Maximum.	Minimum.	Daily mean.		Clear.	Partly cloudy.	Cloudy.	Rain or snow.
1899.	°F.	°F.	°F.	*Inches.*				
May	61	29	43	4.01	3	7	21	17
June	62	33	48.3	4.99	-------	9	21	16
July	87	42	56.5	2.27	6	10	15	8
August	67	40	54.5	8.35	4	7	20	14
September	68	40	51.1	8.52	4	3	23	19
October	62	30	46.3	7.90	3	5	22	17
November	57	29	43.5	7.02	2	3	25	14
December	50	21	35.4	6.94	7	4	20	11
1900.								
January	48	26	36.9	8.71	3	5	23	13
February	47	10	33	3.49	9	2	17	13
March	65	— 1	37.8	2.62	9	8	14	9
April	59	30	41	12.09	5	17	8	22
May	69	31	45.4	4.56	6	21	4	19
June	71	34	51.8	3.13	9	14	7	13
July	69	45	55.4	3.77	2	16	13	16
August	67	40	55.2	7.92	2	22	7	19
September	65	32	50.9	7.82	4	16	10	14
October	58	28	42.5	10.73	3	19	9	20
November	57	15	36.4	9.39	8	7	15	14
December	52	24	37.4	6.59	-------	9	22	24
1901.								
January	48	18	34	9.33	7	3	21	23
February	45	13	30.3	6.38	12	6	10	9
March	46	17	36.8	7.80	4	12	15	25
April	58	27	44.5	7.17	6	12	12	15
May	65	31	44.5	4.86	8	13	10	16
June	61	36	48.6	1.26	2	11	17	9
July	74	35	54.8	.45	8	14	9	6
August	63	39	53.7	10.03	-------	5	26	25
September	65	39	51.4	8.52	3	12	15	16

KILLISNOO. Jos. Zuboff, Observer.

1899.								
January	40	11	29.4	6.41	6	3	22	20
February	42	3	26.5	4.80	3	-------	25	20
March	44	8	28.6	2	12	6	13	7
April	47	27	38.6	1.60	5	3	22	8
May	54	26	40.6	1.40	8	3	20	6
June	65	37	48.7	3.20	1	9	20	10
July	71	44	56.5	.90	10	11	10	4
August	68	40	53.9	1.95	4	5	21	13
September	59	35	46.8	7.40	4	4	22	19
October	52	26	38.5	5.95	4	4	23	22
November	49	25	37.8	6.30	1	3	26	24
December	40	16	29.2	3.45	6	9	16	15
1900.								
January	42	11	31	5.55	3	6	22	17
February	42	10	29.9	3.35	9	4	15	12
March	50	— 2	32.4	2.40	13	3	15	12
April	53	27	40.8	6.85	4	5	21	21
May	60	40	46.2	2.20	7	8	16	10
June	71	33	50.1	4.30	8	6	16	11
July	74	46	57.8	8.45	4	12	15	12
August	70	36	54.2	2.30	1	10	20	16
September	60	35	48	4.25	5	7	18	18
October	54	28	39.5	6	2	5	24	23
November	45	10	31.8	7.05	11	2	17	15
December	45	20	34.1	6.50	-------	5	26	19
1901.								
January	37	13	27	6.95	6	4	21	20
February	41	9	23.2	6.05	11	5	12	11
March	43	12	34.6	5.40	2	6	23	17
April	45	23	36	1.15	2	10	18	7
May	61	31	42.8	.4	4	10	17	15
June	65	34	51.3	1.60	4	14	12	5
July	71	43	57.6	1.40	6	14	11	8
August	66	40	51.5	5.95	-------	9	22	20
September	63	36	49.9	5.50	-------	9	21	17

Meteorological observations—Continued.

JUNEAU. John McLaughlin, Observer.

Month.	Temperature.			Total precipitation.	Weather conditions (number of days).			
	Maximum.	Minimum.	Daily mean.		Clear.	Partly cloudy.	Cloudy.	Rain or snow.
1899.	°F.	°F.	°F.	*Inches.*				
January	44	4	27.4	4.22	11	15	5	17
February	42	4	26	3.81	15	18		13
March	44	10	29.2	1.58	9	9	13	10
April	52	30	40	4.28	6	3	21	19
May	69	29	45	4.68	4	23	4	15
June	68	40	52	5.63	4	8	18	20
July	86	48	62	1.06	18	8	5	7
August	71	42	56	4.88	6	11	14	16
September	66	36	50.3	9.10	5	3	22	23
October	58	26	40.4	11.90	10	6	15	18
November	56	28	40.6	6.71	7	7	16	18
December	48	11	31.4	8.32	13	12	6	16
1900.								
January	40	12	30.6	8.52	11	11	9	20
February	40	10	29	4.09	13	8	7	9
March	61	−5	33.8	3.06	20	7	4	12
April	61	30	41.3	11.37	6	4	20	23
May	64	36	47.2	5	9	10	12	18
June	76	36	53.9	2.27	14	6	10	9
July	77	45	56.2	5.19	7	11	13	12
August	71	39	54.8	6.57	9	4	18	18
September	65	34	50.4	10.84	12	4	14	16
October	55	28	41.5	10.91	10	2	19	20
November	49	10	32.9	12.45	12	6	12	13
December	49	9	32	7.87	3	7	21	25
1901.								
January	40	10	28	9.57	8	3	20	21
February	44	13	26	6.32	16	2	10	8
March	48	16	36	8.23	10	4	17	17
April	55	28	40	8.39	14	3	13	13
May	67	33	46	3.57	10	9	12	17
June	69	39	53.3	1.93	8	10	12	11
July	79	40	57	1.98	15	4	12	12
August	67	45	53.7	14.04	2	2	27	22
September	65	36	49.5	11.41	7	6	17	18

SKAGWAY. George Sexton, Observer.

1899.								
January	40	− 2	22.2	0.94	18	4	9	8
February	44	− 9	19.2	.88	17	3	8	3
March	47	1	23.4	.13	22	3	6	2
April	61	16	41.4	.66	11	18	1	8
May	77.5	25	47.1	1.07	14	11	6	7
June	80	34	54	1.29	10	11	9	11
July	92	41	61.4	.59	19	7	5	3
August								
September	76	30	50	4.68	5	9	16	17
October	53	16	35.7	3.05	10	15	6	10
November	49	24	35.7	2.62	9	6	15	10
December	45	− 1	23.5	1.44	16	4	11	9

SKAGWAY. J. T. Hayne, Observer.

1900.								
January	42	0	17.9	0.86	10	13	8	7
February	41	− 3	23.6	.16	24	2	2	1
March	63	10	29.4	1.00	24	4	3	2
April	58	21	40.4	4.12	10	10	13	13
May	65	30	49	.12	23	6	2	3
June	93	37	58.6	.20	21	8	1	1
July	84	40	59.6	1.70	20	6	5	4
August	75	38	57.9	0	15	15	1	0

Meteorological observations—Continued.

ORCA. Capt. O. J. Humphrey, Observer.

Month.	Temperature.			Total precipitation.	Weather conditions (number of days).			
	Maximum.	Minimum.	Daily mean.		Clear.	Partly cloudy.	Cloudy.	Rain or snow.
1899.	°F.	°F.	°F.	*Inches.*				
June	77	35	51.1	.....	19	1	10	9
July	86	46	61	.....	15	2	14	14
August	78	41	57.1	.....	11	11	7	9
September	74	31	49.2	13.90	.....	.....	.....	.....
October	59	26	38.8	17.87	12	1	18	14
November	48	28	34.4	13.02	4	5	21	16
December	47	10	28.2	9.95	12	3	16	13
1900.								
January	43	10	27.4	9.78	9	0	22	16
February	41	15	30.4	9.93	13	1	14	11
March	57	10	35.9	15.74	16	3	12	10
April	64	25	39.6	16.35	6	2	22	22
May	64	28	43.7	13.70	3	8	20	20
June	.....	.....	.....	4.59	13	4	13	11
July	.....	.....	.....	5.06	9	9	12	13
August	.....	.....	.....	11.25	6	8	17	19
September	.....	.....	.....	15.32	11	1	18	14
October (25 days)	53	25	37.8	7.68	10	3	16	17
November	47	14	28.9	4.75	16	3	11	7
December	47	7	29	13.9	10	3	18	15
1901.								
January	40	9	27.1	16.17	13	1	17	16
February	38	8	25	1.21	13	2	13	5
March	50	11	34	16.91	6	2	23	22
April	.....	.....	.....	.....	.....	.....	.....	.....
May	.....	.....	.....	.....	.....	.....	.....	.....
June	.....	.....	.....	.....	.....	.....	.....	.....
July	79	33	53	3.86	11	8	12	9
August	71	41	52.7	27	3	.....	28	22
September	74	35	49.6	26.3	10	.....	20	19

FORT LISCUM (VALDEZ). James B. Jackson, Observer.

1900.								
November	50	0	22.4	2.85	.....	.....	.....	6
December	39	— 8	21.6	4.82	.....	.....	.....	9
1901.								
January	41	— 1	23.8	9.4	10	7	14	13
February	41	— 12	15.5	.80	16	8	4	3
March	52	10	30.8	6.38	8	8	15	18
April	50	19	31.6	6.20	13	4	13	12
May	57	27	39.4	1.45	23	1	7	4
June	67	32	49.6	1.13	18	.....	12	10
July	73	32	50.5	4.77	22	.....	9	9
August	63	30	46.6	16.21	2	1	28	28

KENAI. H. P. Nielsen, Observer.

1899.								
May	60	22	41	8.20	8	10	13	9
June	68	31	47.9	6.80	13	8	8	7
July	82	31	54.1	1.36	12	8	10	9
August	66	28	51.9	2.34	10	12	9	15
September	73	17	46.3	4.15	7	9	14	13
October	51	10	34.7	4.32	6	6	19	12
November	44	3	27.2	.32	6	6	18	4
December	41	—14	13	.67	14	7	10	6
1900.								
January	38	—26	7.8	1.47	15	8	8	7
February	44	—10	22.9	.31	10	4	14	4
March	52	— 8	30	.32	15	8	8	3
April	58	10	35.2	.52	8	8	14	11
May	60	21	42.7	.37	7	7	17	6
June	77	30	48.8	.55	5	0	25	4
July	72	33	54.9	.86	6	13	12	5
August	66	29	51.8	3.92	8	7	16	16
September	65	21	46.38	3.34	15	4	11	12
October	54	— 5	32.24	2.19	6	10	15	8

Meteorological observations—Continued.

KENAI. H. P. Nielsen, Observer—Continued.

Month.	Temperature.			Total precipitation.	Weather conditions (number of days).			
	Maximum.	Minimum.	Daily mean.		Clear.	Partly cloudy.	Cloudy.	Rain or snow.
1900.	°F.	°F.	°F.	*Inches.*				
November	34	−26	13.3	0.90	14	5	11	6
December	42	−32	14.9	1.15	11	3	15	7
1901.								
January	45	−36	11.7	.64	15	3	12	6
February	37	−28	14.2	.07	13	8	7	1
March	50	−21	28.4	.32	6	12	11	7
April	51	10	32.9	.85	14	4	12	6
May	63	23	42.1	.30	18	7	6	2
June	69	29	50.8	.06	13	6	11	1
July	80	30	52.7	1.76	12	4	15	10
August	73	31	52.5	4.75	3	12	16	16
September	62	19	46.5	2.27	13	4	13	14

TYONEK. Thomas W. Hanmore, Observer.

1899.								
January	34	− 8	5.41	1	19	7	5	6
February	38	−12	15.3	.85	17	.....	11	6
March	48	− 4	23.6	.65	22	.....	9	2
April	52	22	37.7	1.43	19	5	6	3
May	60	30	43.1	1.05	13	10	8	5
June	68	34	53.1	1.20	24	1	5	4
July	82	45	58.7	.....	18	3	10	9
August	71	38	56.4	2.72	10	8	13	17
September	70	29	49	5.51	9	11	10	14
October	52	18	35.4	4.02	9	11	11	12
November	44	7	29.2	.58	10	10	10	3
December	41	0	17	.73	20	4	7	3
1900.								
January	35	0	13.4	2.69	15	4	12	6
February	39	1	23.7	.52	14	4	10	6
March	58	1	31.9	.59	17	5	9	5
April	56	11	35.5	.60	9	10	11	6
May	68	33	45.4	.29	12	8	11	5
June	82	40	52.9	.72	23	0	7	6
July	75	40	57	1.05	18	7	6	5
August	73	31	54.6	4.94	10	5	16	17
September	67	32	48.7	4.22	14	7	9	11
October	61	10	36.3	1.87	16	3	12	8
November	34	− 6	16.6	.60	18	4	8	3
December	42	−17	13.9	1.54	15	2	14	7
1901.								
January	38	−19	14.9	1.55	18	3	10	9
February	36	−17	29.3	.20	16	2	10	5
March	46	− 3	33.5	.62	12	5	14	6
April	56	12	33.5	.1	19	3	8	5
May	67	22	45.3	.04	25	4	1	1
June	74	33	53.8	.53	15	9	6	7
July	83	38	59	2.68	18	5	8	8
August	62	37	51.7	5.77	5	9	17	17

KADIAK. William J. Fisher, Observer.

1899.								
January	51	− 1	25.3	4.72	10	2	9	16
February	52	5	33.5	4.44	7	3	18	14
March	64	11	36	4.17	18	4	9	11
April	61	23	35.9	3.02	15	2	13	14
May	62	24	44.5	4.97	15	5	11	14
June	76	34	54	2.11	20	2	8	9
July	82	41	59.4	.82	19	3	9	7
August	75	41	58.2	2.37	20	3	8	10
September	.....	.....	.....	.....	.....	.....	.....	.....
October	59	31	43.3	6.31	13	2	16	19
November	53	23	38.4	5.57	7	0	23	19
December	.....	.....	.....	.....	.....	.....	.....	.....

Meteorological observations—Continued.

KADIAK AND WOOD ISLAND. Curtis P. Coe, Observer.

Month.	Temperature.			Total precipitation.	Weather conditions (number of days).			
	Maximum.	Minimum.	Daily mean.		Clear.	Partly cloudy.	Cloudy.	Rain or snow.
1900.	°F.	°F.	°F.	*Inches.*				
January (27 days)	49	0	28.25	2.95	7	2	18	10
February	49	20	35.4	6.19	9	0	19	19
March	51	18	37.92	7.46	9	5	17	18
April	54	11	37.8	2.60	12	5	12	12
May	64	30	44.8	6.62	7	8	16	16
June	71	39	51.6	3.35	12	2	16	9
July	68	45	54.94	6.64	8	5	18	12
August	70	42	56.6	2.74	9	8	14	17
September	68	36	50.4	1.95	.....	.....	.....	12
October (25 days)	63	22	41.9	1.85	4	4	18	9

WOOD ISLAND. Curtis P. Coe, Observer.

1900.								
October	63	22	42.2	1.86	4	4	18	9
November	54	9	31.9	2.28	14	2	14	5
December	49	12	31.7	4.73	11	5	15	9
1901.								
January	47	7	30	2.65	11	6	14	9
February	58	4	30.6	.30	15	10	3	3
March	54	5	34.8	3.85	5	8	18	18
April (16 days)	55	17	36.4	4.20	10	3	3	8
May	63	20	43.2	3.45	15	3	13	16
June	73	37	51.2	4.50	15	3	12	11
July	79	42	55.3	3.56	14	3	14	8
August	70	43	54.6	5.13	4	5	22	19

COAL HARBOR, UNGA ISLAND. H. S. Tibbey, Observer.

1899.								
January	45	− 6	26.3	3.30	10	6	15	13
February	45	0	31.9	3.77	8	3	17	14
March	48	5	34.6	4.04	10	14	7	12
April	50	25	35.8	1.82	5	3	22	14
May	54	20	39.5	3.72	5	4	22	14
June	65	15	40	.39	18	1	11	4
July	79	40	54.9	6.21	12	5	14	12
August	69	42	54	4.87	5	4	22	10
September	66	32	48.7	4.99	5	3	22	11
October	58	31	43.6	5.04	7	2	22	18
November	49	21	36	1.91	10	0	20	6
December	46	5	27.9	.70	5	4	22	4
1900.								
January	46	0	28.1	2.69	5	2	24	8
February	51	17	35	4.33	3	0	25	16
March	53	10	33.4	2.09	11	3	17	8
April	47	10	32.3	15.53	1	9	20	19
May	57	24	40.7	2.16	2	14	15	8
June	69	36	49.5	1.88	1	6	23	6
July	69	40	51.6	2.91	5	7	19	17
August	69	42	54.2	5.74	0	4	27	16
September	64	34	49.4	4.65	3	7	20	13
October	60	25	43	5.35	.....	4	27	24
November	56	18	36	7.98	4	5	21	19
December	47	13	31	3.20	8	3	20	18
1901.								
January	47	11	31	4.15	9	5	17	14
February	49	− 2	29	6.36	7	3	18	16
March	48	7	27.6	1.98	3	6	22	16
April	50	12	31.8	3.54	2	7	21	19
May	57	22	38.7	.66	8	8	15	9
June	61	29	45.3	2.21	10	4	16	14
July	69	38	51.9	1.64	8	8	15	8
August	68	38	52.2	1.63	2	5	24	18

Meteorological observations—Continued.

ST. MICHAEL. Rev. J. Post, Observer.

Month.	Temperature.			Total precipitation.	Weather conditions (number of days).			
	Maximum.	Minimum.	Daily mean.		Clear.	Partly cloudy.	Cloudy.	Rain or snow.
1899.	°F.	°F.	°F.	Inches.				
October	42	13	32.2	0.04	3	13	15	2
November	31	1	17.4	.80	4	8	18	5
December	35	−36	4.4	0	7	7	17	0
1900.								
January	30	−38	− 6.1	.40	18	4	9	2
February	38	−13	16	1	13	5	10	1
March	40	−18	10.4	1	15	3	13	1
April	44	−26	17.6	.40	9	2	19	2
May	54	17	34.7	0	8	6	17	0
June	64	31	44.2	0	10	3	17	0
July	77	40	55.6	(a)	5	5	21	.....
August	65	37	50.2	(a)	2	2	27	.....
September	56	25	43.6	(a)	.....	.....	30	.....
October	53	0	30.4	(a)	3	2	26	.....
November	43	− 9	21	(a)	9	2	19	.....
December	33	−12	11	(a)	8	3	20	.....
1901.								
January	37	−30	− 5.4	(a)	18	1	12	.....
February	38	−27	7	(a)	15	1	12	.....
March	24	−16	3.5	(a)	15	2	14	.....
April	37	−15	11.8	(a)	15	3	12	.....
May	43	− 3	25.2	(a)	13	1	17	.....
June	61	23	40.8	(a)	3	1	26	.....

NOME. N. A. T. & T. Co., Observer.

August (19 days)	59	28	45.4	0.60	9	10	0	3
September	54	22	39	7	11	4	15	17

KOTZEBUE SOUND. Anna M. Foster, Observer.

1898.								
June	72	27	48	(a)	20	(a)	10	(a)
July	81	82	55	(a)	14	(a)	17	(a)
August	64	38	50	(a)	8	(a)	23	(a)
September	50	25	39.4	(a)	12	(a)	13	(a)
October	43	− 5	24.3	(a)	18	(a)	13	(a)
November	19	−23	0	(a)	17	(a)	13	(a)
December	27	−39	7.2	(a)	13	(a)	18	(a)
1899.								
January	17	−31	−10	(a)	17	(a)	14	(a)
February	23	−38	− 9	(a)	20	(a)	8	(a)
March	32	−36	1	(a)	15	(a)	16	(a)
April	40	−24	12	(a)	16	(a)	14	(a)
May	59	− 4	29.3	(a)	13	(a)	17	(a)
June	53	27	37.4	(a)	14	(a)	16	(a)
July	67	34	49.4	(a)	13	(a)	18	(a)
August	63	18	38.6	(a)	16	(a)	15	(a)
September	63	18	38.6	(a)	16	(a)	15	(a)
October	37	− 2	22	(a)	8	(a)	23	(a)
November	22	−17	7	(a)	15	(a)	15	(a)
December	22	−35	− 9	(a)	13	(a)	18	(a)

KOTZEBUE SOUND. Robert Samms, Observer.

1900.								
January	21	−43	−17.1	(a)	20	(a)	11	(a)
February	29	−25	3.3	(a)	19	(a)	9	(a)
March	39	−27	1.2	(a)	20	(a)	11	(a)
April	39	−27	7.6	(a)	17	(a)	13	(a)
May	44	2	28.7	(a)	25	(a)	6	(a)
June	65	27	39.2	(a)	16	(a)	14	(a)
July	71	35	53	(a)	23	(a)	8	(a)

[a] Not reported.

Meteorological observations—Continued.

KOTZEBUE SOUND. Robert Samms, Observer—Continued.

Month.	Temperature.			Total precipitation.	Weather conditions (number of days).			
	Maximum.	Minimum.	Daily mean.		Clear.	Partly cloudy.	Cloudy.	Rain or snow.
1900.	°F.	°F.	°F.	Inches.				
August	66	31	48.8	(a)	15	.....	16	.....
September	52	27	39.1	(a)	6	.....	24	.....
October	45	−14	22.7	(a)	10	.....	21	.....
November	38	−20	9	(a)	15	.....	15	.....
December	20	−26	2	(a)	8	.....	23	.....
1901.								
January	33	−50	−24.8	(a)	11	.....	20	.....
February	34	−45	− 6.5	(a)	14	.....	14	.....
March	22	−27	− .5	(a)	28	.....	3	1
April	35	−20	8.3	(a)	20	.....	10	.....
May	48	.....	22.6	(a)	19	.....	12	.....

EAGLE. U. G. Myers, Section Director.

1899.								
August (16 days)	76	24	50.1	1.63	2	5	9	8
September	66	8	41	.80	3	7	20	7
October	41	−19	21	.65	4	9	18	7
November	33	−25	1.2	.52	2	4	24	5
December	31	−57	−19	.26	15	3	13	6
1900.								
January	23	−68	−24.8	.52	14	6	11	7
February	18	−51	− 6	.39	11	9	9	5
March	56	−46	13	.02	17	8	6	2
April	54	−12	29.3	.42	6	13	11	6
May	69	20	42.2	.84	9	17	5	7
June	87	28	52.6	1.57	8	7	15	13
July	81	31	56.9	1.88	12	9	10	13
August	79	25	49.1	2.71	2	9	20	16
September	68	15	40.4	1.72	4	6	20	14
October	44	−17	20.1	1.23	5	10	16	10
November	18	−42	−10	.21	9	8	13	5
December	32	−52	− 7.4	.77	9	6	16	8
1901.								
January	32	−68	−17.8	.42	13	8	10	8
February	28	−65	−15.3	.55	15	6	7	4
March	42	−49	5	.55	9	8	14	9
April	53	−26	19	.56	8	12	10	6
May	71	16	39.1	1.63	11	8	12	9
June	34	27	52.8	1.22	3	13	14	11
July	85	36	57.6	1.47	9	9	13	12

FORT YUKON. L. J. H. Wooden, Observer.

1899.								
September	54	9	34.3	0.10	.....	.....	.....	.....
October	40	−13	18.7	.45	4	15	12	6
November	23	−34	− 1.4	.30	8	12	10	3
December	16	−68	−16.1	.47	4	10	17	5
1900.								
January	.....	−62	.....	.36	19	5	7	7
February	.....	−44	.....	.00	20	8	0	0
March	.....	−42	.....	.42	14	10	7	5
April	.....	−21	.....	.05	15	9	6	3
May	.....	.....	.....	.....	.....	.....	.....	.....
June	93	27	58.6	1.19	6	21	3	9
July	87	41	64.2	.32	13	15	3	3
August	80	23	53.6	1.32	5	9	16	11
September	70	19	42.6	.45	5	4	19	8
October	48	−17	16.9	.59	5	11	15	11
November	22	−48	−10.8	.51	8	13	9	6
December	8	−56	−26	.24	5	9	17	5

[a] Not reported.

Meteorological observations—Continued.

FORT YUKON. L. J. H. Wooden, Observer—Continued.

Month.	Temperature.			Total precipitation.	Weather conditions (number of days).			
	Maximum.	Minimum.	Daily mean.		Clear.	Partly cloudy.	Cloudy.	Rain or snow.
1901.	°F.	°F.	°F.	*Inches.*				
January	.....	−65	.....	0.55	12	5	13	8
February	.....	−53	.....	.03	15	9	4	2
March	25	−41	1.6	.38	9	17	5	8
April	51	−16	17.4	.56	16	14	.....	5
May	66	8	33.2	.46	17	13	1	6
June	85	26	58.6	.41	12	18	.....	4

RAMPART. Alvin Liebes, Observer.

1900.								
September (last 6 days)	49	22	41.2	(a)	1	.....	5	1
October (23 days)	45	−12	22.7	(a)	2	3	18	.....
November	28	−52	− 5.8	(a)	.....	.....	.....	.....
December	30	−53	−11.2	(a)	.....	.....	.....	.....
1901.								
January	19	−61	−23.4	(a)	.....	.....	.....	.....
February	41	−48	−10.3	(b)	.....	.....	.....	.....

HOLY CROSS MISSION. Rev. R. J. Crimont, Observer.

1898.								
November	32	−23	1.9	2.48	9	10	11	13
December	30	−37	3.4	.....	9	15	7	5
1899.								
January	35	−40	− 3.2	5.10	15	6	10	3
February	39	−37	− 3.1	1.46	18	5	5	0
March	45	16	15.6	1.49	14	9	8	6
April	46	0	27.3	1.42	13	9	8	9
May	57	13	39.4	.30	18	12	11	8
June	74	24	50.6	.....	11	12	7	.....
July	82	31	56.9	.....	8	6	17	.....
August	70	31	51.5	3.67	0	12	19	14
September	62	17	40.9	4.40	2	15	13	19
October	44	16	30.3	1.17	4	12	15	15
November	23	− 5	10.6	.49	10	18	2	8
December	34	−40	− 2.2	.82	16	7	8	9
1900.								
January	35	−55	− 9.6	.74	23	4	4	7
February	39	−15	14.7	.57	12	8	8	8
March	44	−13	15.5	.50	22	4	5	5
April	48	−21	24.7	.46	5	15	10	6
May	63	18	42.5	.92	5	18	8	11
June	74	29	52.4	1.67	16	7	7	7
July	77	41	58.8	1.44	12	10	9	15
August	64	35	52	5.74	2	10	19	29
September	57	25	44.1	6.69	3	15	12	20
October	57	−14	27.8	3.34	4	11	16	18
November	41	−19	14.4	1.98	12	6	12	7
December	35	−24	5.8	4.49	10	9	12	16
1901.								
January	30	−45	−11.4	1.46	14	4	13	9
February	41	−32	8.3	2.46	9	9	10	11
March	37	−28	10	1.06	5	20	6	10
April	46	−13	20.6	.55	14	8	8	6
May	57	8	35.2	.13	16	12	3	3
June	70	29	51.9	.85	7	13	10	10

[a] Not reported.
[b] Rain from evening of 4th to evening of 7th.

ANNUAL REPORT OF THE HAWAII AGRICULTURAL EXPERIMENT STATION FOR 1901.

By JARED G. SMITH, *Special Agent in Charge.*

INTRODUCTION.

The establishment of the present agricultural experiment station in the Hawaiian Islands had its inception in the appropriation made by the Fifty-sixth Congress, first session, when the sum of $10,000 was granted to enable the Secretary of Agriculture to investigate the field and establish an experiment station in Hawaii as has been done elsewhere. In pursuance of the act of Congress, Dr. W. C. Stubbs, director of the Louisiana Agricultural Experiment Stations, was sent to Hawaii during the summer of 1900, and the results of his inquiry are given in a report transmitted to Congress in January, 1901, and published as House Doc. 368 (Fifty-sixth Congress, second session), and afterwards as Bulletin 95 of the Office of Experiment Stations of the U. S. Department of Agriculture. Dr. Stubbs was instructed to investigate the agricultural conditions of the islands, with special reference to the organization and work of an experiment station. It was recommended by him that the station to be established should be under the control of the Secretary of Agriculture and independent of local institutions. A station for the study of all matters pertaining to the sugar industry has been maintained for a number of years by the Hawaiian Sugar Planters' Association, and as it will continue to prosecute its work upon problems relating to the sugar industry it was believed best that the station to be established under the auspices of the Department of Agriculture should devote its energies chiefly to other agricultural interests. Among the subjects to which it was suggested the station should give its attention are the culture of fruits, vegetables, rice, forage crops, coffee growing, stock raising, dairying, irrigation, and forestry.

After conferring with the local authorities, the tract known as Kewalo-uka, adjoining the city of Honolulu, was recommended as a site for the station. (Pl. XXV.) This tract had been set aside by former officials for experimental investigations in agriculture and forestry. An examination of the records of the former Hawaiian Government showed that while there was a very evident intention to reserve this land for experimental purposes, the necessary formalities were

never fully carried out. Subsequently 20 acres was reserved by Presidential proclamation as a site for a hospital for the Navy Department, and 7 acres for the same purpose for the Marine-Hospital Service under the Treasury Department.

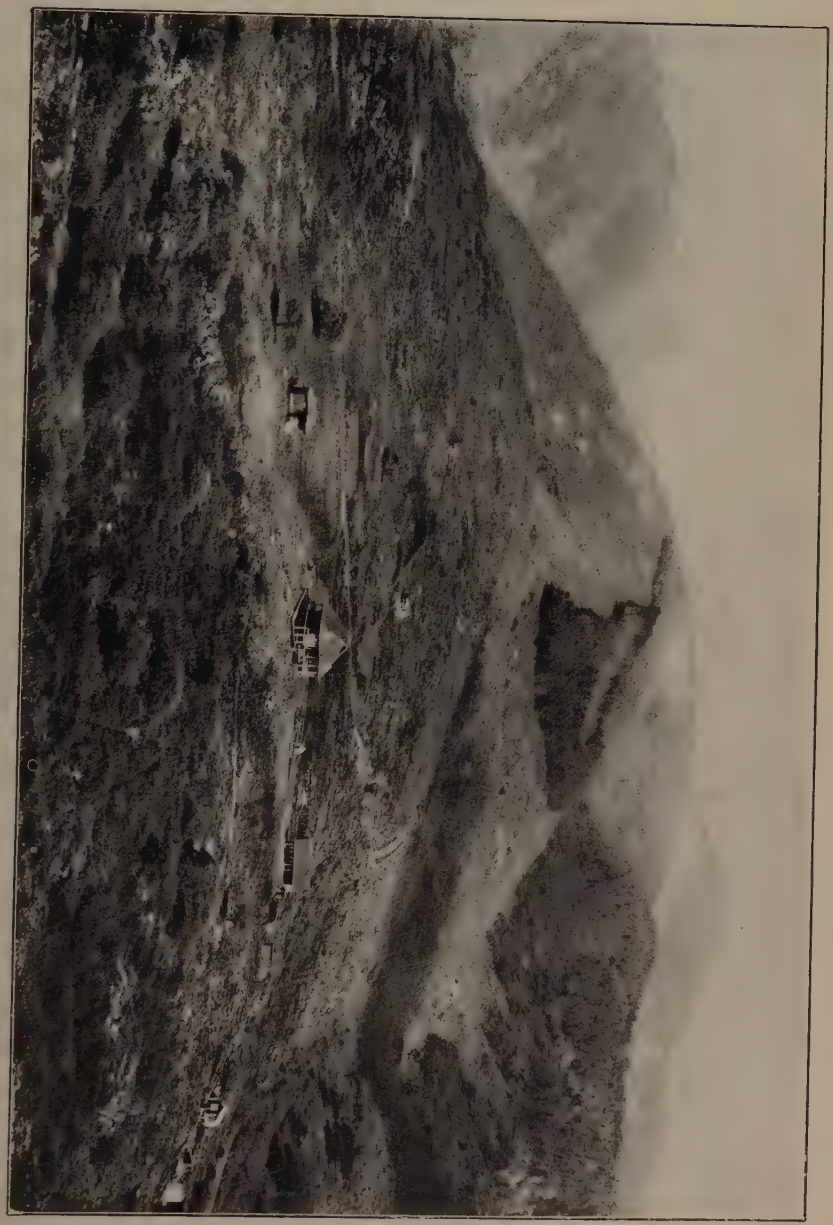
Acting upon the suggestions made in the preliminary report, Congress appropriated $12,000 for continuing the work during the current fiscal year, and immediate measures were taken to establish and equip a station in accordance with the above recommendations. Accordingly the writer was transferred to the Office of Experiment Stations from the Section of Seed and Plant Introduction of the Department of Agriculture, and was charged with the responsibility of beginning the work of organization of the Hawaii Agricultural Experiment Station. In carrying out my instructions I left Washington, D. C., March 21, 1901, arriving in Honolulu on April 5, and at once began active operations to carry out the desires of the honorable Secretary of Agriculture as I understood them.

A temporary office was secured in the Territorial capital building and was fitted up with desks, office furniture, bookcases, etc.

DETAILED REPORT OF WORK.

The period from April 5 to May 15 was occupied in making preliminary surveys of the land which had been set apart for the use of the station, the Kewalo-uka tract in Makiki Valley, adjacent to the city of Honolulu. This tract, containing 154 acres, lying along the southeast slope of the Punchbowl and Tantalus ridge, is nearly 2 miles long and has a maximum width of about 300 yards at its lowest portion, nearest the city, and about 100 yards at the upper end. The elevation ranges from 125 feet, nearest the city, to 1,350 feet on the end nearest Mount Tantalus, the height of that peak being 2,013 feet.

Although the preliminary arrangements had been entered into in September, 1900, between the governor of the Territory and Dr. Stubbs, yet the formal transfer did not take place until June 10, 1901, when two tracts were reserved to the Territory, one of 10 acres as a stone quarry and a second of 52 acres on the slopes and within the crater of Punchbowl Hill, which was reserved for a public park. By the courtesy of the Secretary of the Navy this Department was granted the temporary use of the naval hospital site for experimental purposes. The work of clearing land and erecting buildings was begun with as little delay as possible. Twenty-four acres, comprising all of the Naval Hospital Reservation and land adjacent to it, was cleared of a dense growth of guava and lantana bushes, prickly pear, and algaroba or mesquite bean woods. (Pl. XXVI, fig. 1.) The contract under which the work was performed called for the removal of all tree stumps and roots and plowing the land to the depth of 20 inches. This work was



HAWAII STATION SITE.

FIG. 1.—HAWAII STATION—VIEW OF STATION SITE BEFORE BEGINNING CLEARING.

FIG. 2.—HAWAII STATION—BUILDING TERRACES ON UPPER PART OF STATION FARM.

FIG. 1.—HAWAII STATION—DIRECTOR'S RESIDENCE.

FIG. 2.—HAWAII STATION—STABLE.

not completed within the period agreed upon, but was carried out in an extremely careful manner, reflecting great credit upon the contractor. The cost of this work amounted to $30 per acre. About 30 cords of wood, worth $10 a cord, were obtained from this land and are now on hand subject to sale.

Thirteen acres of 15-year-old planted eucalyptus or Australian gum forest was also cleared at the upper end of the tract at a contract price of $65 per acre. (Pl. XXVI, fig 2). The trees were very dense in this forest, and the cost of removal of roots and stumps much greater than in the open algaroba and guava woods at the lower elevation. This contract was carried out by Japanese labor and was not as efficiently performed as the previous one, given to an American firm. About 400 cords of wood were secured by the station, valued at $3 to $3.50 per cord.

Contracts were also let for the erection of an office and a residence building. The office contains two rooms, and is intended to be only one wing of a building, the remainder to be completed at a later date.

The residence contains six rooms. Both office and residence occupy a commanding position on the heights above and back of Honolulu, at an elevation of 350 feet above sea level. These buildings cost $3,900, the contract not including the painting. (Pl. XXVII, fig. 1.)

A 2-story stable, 18 by 32 feet, with three stalls, carriage room, tool and harness rooms, was planned and built by the special agent in charge. In connection with the stable are a 2,000-gallon tank, watering trough, and manure shed, and there are feed bins and chutes at convenient location. (Pl. XXVII, fig. 2.)

A 2-room hut or cottage was also built to serve as quarters for the laborers employed. A poultry house and poultry yard inclosed by wire netting has been built; also a small house in which to store dynamite, considerable amounts of which have been used in blasting and grading operations necessary in grading and making roads around the station buildings.

A seed bed was prepared and covered over with slats in lieu of a glass or canvas covered propagating house.

The location of the station buildings having been made above the level to which city water is at present supplied, a water system had to be installed by the station. A line of 1-inch pipe was laid 900 feet to connect with the city water system, and a 10,000-gallon tank was placed at an elevation of 250 feet, that being the maximum height above sea level at which city water is now supplied. Another 10,000-gallon tank was erected back of the residence, at a height above the floor line to give enough water pressure in both office and residence.

A 1½-horsepower gasoline engine and double-acting pump were installed at the 260-foot level, and the water is pumped through a 2-inch galvanized iron pipe into the upper tank. A 4-inch swing check

valve was placed between the pump and the upper tank to relieve the engine from the longitudinal vibration resulting from the alternating rise and fall of the 2-inch column of water in the discharge pipe. The working pressure is about 47 pounds. All outside water connections, including the installation of the pumping plant, were made by station employees and not by contract; this having proved the only satisfactory way of getting work done, and at the same time the cheapest.

A dark room for photographic work and the storage of chemicals has been built in one of the office rooms, and a water-closet is also being added. About 200 feet of board walks have been laid. All station buildings have been painted at least one coat by workmen employed direct by the station, this having been found to be the cheapest and most satisfactory method for all work. A garden has been prepared by trenching the soil and adding lime. About 20 acres on the slope above the station buildings had been roughly cleared of guava and lantana to allow the grass to grow up for pasturage. Tools required for the large force of laborers employed have been purchased from time to time, so that there is now on hand a very satisfactory supply, including the ordinary farm, blacksmith, and carpenter's articles. A blacksmith shop is planned and will shortly be erected, so that repairs and breakages may be attended to without delay and at little cost.

A fire plug with 50 feet of fire hose has been connected with the main discharge pipe from the pump to give needed fire protection. Other connections will be installed at each of the principal buildings. The large tank has been connected with the one beside the stable, and this in turn with a smaller one at the laborers' quarters, and connections have been made where easy of access in the garden for irrigation, on a moderate scale.

On the upper clearing where the blue-gum forest was cut away, about 1½ acres have been dug over and terraced, using some of the cord wood for buttress work. Here also a two-room hut has been erected for laborers' quarters, at an elevation of about 1,075 feet. This cottage has a corrugated galvanized-iron roof, made with a 4-foot overhang, the idea being to collect as much rainfall as possible. Besides the two living rooms there is a large supply and tool room. The water from the room is stored in a 3,000-gallon tank; pipes are laid from this so that the water can be used on the terraces. A 2,000-gallon tank and lumber for the construction of a small stable are now on the ground and will be put up some time this winter. These buildings were considered necessary because of the elevation above the main station buildings. The upper clearing is more than a mile from the office by the most direct route, along a narrow and steep bridle trail, or fully 4 miles by the winding Tantalus wagon road.

This comprises in brief the constructive work on the Hawaii Experi-

ment Station for the period from April 5 to November 1, 1901, seven months.

The correspondence has been rather large, the station having already given assistance and information to many farmers in all the islands of the group.

Some poultry experiments have also been inaugurated. These could be undertaken immediately without great expense, and it is hoped that they may lead to results of immediate practical usefulness. Largely because of the great number of diseases with which barnyard fowls are afflicted in the Hawaiian Islands the supply of poultry does not meet the demand. Live chickens sell in Honolulu markets for $15 a dozen and eggs at from 40 to 50 cents a dozen. If the station can demonstrate a practical way for the economical production of chickens and eggs it will add largely to the resources of the small farmers on the islands. The ravages of the disease known as sore head are so severe as to almost prevent the raising of domestic fowls. An article on Chickens and their diseases in Hawaii has been prepared by my assistant, Mr. T. F. Sedgwick, and published as Bulletin No. 1 of the Hawaii Station. This treats of sore head, as well as of several other common diseases, and gives simple precautions and preventive measures which, if adopted by poultry growers, will do much toward enabling farmers to fight disease.

As soon as possible, experiments will be begun in animal husbandry and dairying. Owing largely to an insufficiency of forage, meats are very expensive. In the markets of Honolulu hogs sell for from 10 to 17 cents per pound live weight. To remedy this difficulty it is intended to undertake at an early day feeding experiments with various roots and tubers and with the common papaya as food for swine.

As soon as possible, experiments in dairying should be undertaken upon a carefully planned system. Dairying and cattle feeding are now being carried on on a small scale with some measure of success, but the supply of milk and butter is insufficient to meet the demands of the home trade. Island butter retails for 60 cents per pound, milk for 12 cents a quart, and Hawaiian-made cheese is almost unknown in the Hawaiian markets. A few of the dairies are managed on a scientific basis.

There is, moreover, widespread ignorance of the best combinations of feeds and too great dependence on one-sided rations both in feeding dairy cattle and in fattening animals for the shambles. The use and necessity of leguminous forage plants are not recognized. Enough by-products of the sugar plantations are burned every year to feed all the beef, pork, and mutton consumed in the islands.

Experiments should be conducted in the utilization of the waste cane tops in the form of silage for feeding dairy cattle and beef steers, and with the waste molasses for fattening sheep, cattle, and hogs. On

some plantations the work horses and mules are fed cane tops and molasses to good advantage. The practice can be extended to other branches of animal husbandry with profit. But it is of even greater importance that extensive experiments be carried on with forage plants rich in protein, the clovers and beans, to supplement and fully utilize the heat and fat-making constituents of the cane top and sorghum rations generally used. The Hawaiian Islands can grow and fatten more than enough animals to supply the home demand. At present, considerable importations of cattle, beef, mutton, hogs, and pork are made from the mainland, Australia, and New Zealand. Because of the location of the group, Hawaii ought to be able to command a superior market for all her surplus dairy and meat products in the Orient.

HORTICULTURAL INVESTIGATIONS.

Plans are being made for experiments in horticulture, including both fruits and vegetables, and coffee culture. These will include experiments with reference to the methods and times of pruning, methods of cultivation, picking, and marketing, as well as tests of varieties.

The Hawaiian Islands market depends largely on supplies of fruits from the mainland at all seasons of the year. Not only can enough fruit in sufficient variety be grown to supply the local markets, but both fruit and vegetables might be grown for export. The Honolulu market is usually well supplied with fruits and vegetables, though not always of the best quality nor in large variety, but the plantations, farms, and ranches depend largely on canned products. Work to show the practicability of the growing of a wide range of fruits and vegetables for the home table at a distance from well filled markets will be profitable and desirable.

It is hoped that experiments in coffee culture and the growing of various spices and drugs may also be undertaken at an early day.

COFFEE IN HAWAII.

Probably $10,000,000 has been sunk in unprofitable coffee cultivation in these islands during the last ten years. An intelligent investigation of all phases of the coffee industry will well repay. Coffee is a white man's crop. It is grown at elevations unsuited to cane and where the climate is admirably adapted to a comfortable and healthful existence.

The coffee lands of Hawaii can be made as productive as any in the world. Experiments in the selection and crossing of varieties to produce more prolific or hardier trees, and especially an investigation of the methods of curing coffee, should be made in an effort to save this industry. Hawaiian coffee has already made for itself an enviable

reputation for quality and flavor of berry. If it could be sold on its merits instead of in competition with the low-grade coffees of Brazil and Central America, it would in time prove an immensely profitable crop. An effort should be made to save this industry from total extinction. It is a crop especially suited to the small farmer and the small investor—the man who can build up a home and care for his crop himself. The establishment of the coffee industry on a successful basis would make the Hawaiian Islands a land of small farmers more quickly than the transformation could be accomplished in any other way or through the medium of any other crop or industry.

The exports of coffee from the Territory of Hawaii during the fiscal year ended June 30, 1901, amounted to upward of 2,600,000 pounds, valued at $311,000. The production of 1901 has been greater than that for any preceding year. This increase in yield and amount exported is in spite of unprecedentedly low prices for coffee and a general overstocking of the markets of the world. The downward trend of the prices of all grades of coffee since 1895 has brought ruin to hundreds of small planters in the Hawaiian Islands. Only those continue in the industry who have sufficient capital to tide over years of depression, or who are content to market their product at or below the bare cost of production. Those of the former class are very few in number; those of the latter comprise the hundreds of Portuguese, Hawaiian, and Japanese landowners, homesteaders, and renters having 5, 10, 20, or sometimes 40 acres of bearing trees. In most of the coffee districts on the islands the owners of the larger tracts of bearing coffee have ceased to cultivate their plantations and are spending no money on the harvesting of the crop, allowing the berries to dry on the trees or rot on the ground, unless they are able to make contracts with Japanese or Portuguese to harvest the crop on shares, and in that case are content with one-fifth to one-half of the crop, the Japanese or Portuguese laborer receiving the balance in payment for his services.

The islands on which there are now bearing plantations of coffee are, in the order of their importance, Hawaii, Maui, Kauai, and Oahu.

On Hawaii, where the largest areas are planted, the chief producing districts are, in the order of their importance, Kona, Olaa, and Hamakua, while Kau, Hilo, Puna, and Waimea add their quota to the whole.

A preliminary survey has been made of the Hamakua, Olaa, and Puna districts of Hawaii, all lying on the windward, or west coast of the island. Even a most hurried glance at these few districts can not fail to impress upon the visitor the fact that the island of Hawaii is the home of coffee. Whether the plant is given the most scientific and careful cultivation, or through stress of circumstances the plantation has become overgrown with fern and weed and is totally uncared for, the trees throughout show a thrift and a freedom from disease which

augurs well for the success of this crop whenever market conditions or a rise in prices again permit the rehabilitation of the industry. Even under the most adverse conditions of shallow, sterile soils, excessive rainfall, and acid or poisonous subsoils the yield per tree and per acre is often surprisingly large. On the Horner plantation, Kukaiau, 400 trees yielded 1,500 pounds of coffee at their first crop. On both the Horner and Louisson plantations in Hamakua, individual trees have yielded from 5 to 7 pounds of coffee—not simply selected trees at wide intervals, but whole fields. As judged by results in pounds of coffee per acre, the Hamakua district is absolutely ideal for this crop, and this district alone can challenge the world with the quality of its product. The berries are borne (on the Guatemalan variety) from 20 to 30 in a cluster, and the clusters are so thick along the branches that one wonders how any more berries could possibly be borne on any part of the plant, unless they were underground on the root. (Pl. XXVIII, fig. 1.)

The coffee lands of Hamakua overlap the cane lands. Mr. J. M. Horner, the pioneer in this industry, states that the area suited to coffee in Hamakua comprises a belt 35 miles long and 3 miles wide, and from 500 to 3,000 feet elevation. It reaches from about 2 miles on the Hilo side of the Maulua gulch to the Kohala plain. The bulk of this 67,200 acres is still government land, and if such conditions should arise as would permit an extension of the coffee industry in Hawaii nearly all of this area could be utilized. At a fair average yield of one-half ton per acre, the arable portion of this stretch of fertile forest land could be made to produce from 25,000,000 to 30,000,000 pounds of coffee per annum. Hamakua coffee was awarded the highest premium at the Omaha Exposition, in competition with coffee from all over the world—from Java, Brazil, Central America, Arabia, and various South American countries.

The typical Hamakua coffee soil is a mellow forest loam, deep and well drained yet retentive of moisture, easily worked, and quickly responding to fertilization and good cultivation. The district is distinguished from those bordering it by an absence of running streams. The abundant rainfall (about 100 inches per annum) sinks into the porous soil and is readily conserved by deep tillage. It was a matter of comment that the crops grown on these typical coffee soils exhibited a remarkable resistance to drought during the dry season of 1901.

At the time of the height of the coffee industry in Hawaii, in 1897, 1898, and 1899, upward of 6,000 acres were planted to this crop in the Olaa district. There were about 1,500 families of small settlers and homsteaders in the Puna, Hilo and Olaa districts, all more or less dependent on the future of coffee. Now, December, 1901, there are not to exceed 250 families. Of the 200 white settlers in Olaa alone, only some 25 now remain, and most of these depend on other money crops

FIG. 1.—HAWAII STATION—THREE-YEAR-OLD HORNER'S GUATEMALA COFFEE.

FIG. 2.—HAWAII STATION—JAPANESE PICKING COFFEE.

than coffee. A typical 100-acre farm formerly in coffee now consists of 20 acres cane, 15 coffee, 15 orange, 2 lemon, 4 bananas, 1 pineapples, 1 bamboo, 4 forage crops, 2 pasture, 6 experimental garden, 4 prepared for planting bananas, and the balance forest and the lands surrounding the home buildings. Most of the Olaa and almost all of the Hilo and Puna coffee orchards have been pulled up and cane planted in their stead, or have been simply deserted by their owners. Deserted homes characterize the formerly prosperous Olaa colony. The loss of capital in this one district amounts to over $2,000,000 in the last five years.

The cause of the failure of the coffee industry in Hawaii has been primarily the abnormally low prices of coffee, due to overproduction in coffee-growing countries all over the world. Annexation made the sugar planters wealthy because Hawaiian sugar was at once admitted duty free. It also brought ruin to the coffee planters because it placed Hawaiian coffee in competition with the South and Central American duty-free coffee, whereas there had been up to the time of annexation a duty on foreign coffees imported into Hawaii. It reaches its optimum development at elevations of from 1,300 to 2,500 feet above sea level, and in this Territory that belt is, on all the islands, one where the climatic conditions are ideal. If coffee can be restored by Congress to the same status which it enjoyed previous to American control, Hawaii and Porto Rico can produce within ten years all of the amount consumed by the United States. A duty of from 2½ to 5 cents per pound on coffee would do more toward making Hawaii a land of prosperous homesteads and prosperous people than any other legislative measure which could be taken. The coffee lands lie above the cane lands and the development of the coffee industry will thus not interfere with cane growing. But in case sugar should even go down to such a point that its cultivation would prove unprofitable, at least a portion of the cane lands in some portions of the islands would be capable of profitable conversion into coffee. There has been enough experience in coffee growing in these islands to develop a distinctly Hawaiian system of cultivation and treatment. The mistakes made by new men in a new land with a new and untried crop, such, for instance, as that of using Ceylon methods in Olaa, have been costly, but such work will not have to be done over again. There are still many men who believe in the future of coffee in Hawaii. These are maintaining their plantations at least possible cost, but with a view to deriving at least a living from the land. The low prices for the crop have weeded out all except these who were conducting the business on an economical basis.

There are, at a low estimate, 200,000 acres of coffee lands on the four islands, Oahu, Maui, Kauai, and Hawaii, most of it still virgin forest. And there is another 100,000 acres and more which would not fall within the belt of optimum conditions, but where coffee could

undoubtedly be grown. The limit of production would be near 100,000 tons, and this yield could be reached without converting to the purpose one single acre of land on which sugar cane is now grown. If Congress will afford to coffee the same protection which is extended to sugar, it would mean not only the building up of an industry among our own people and within our own borders, but the establishment of this industry on a firm basis would also mean a marked increase in the number of small landowners. From the national standpoint, that State which produces or can produce within its own borders the greatest number of necessaries consumed by its own people is the strongest. To foster the coffee industry in these islands of the Pacific will be to make Hawaii a stronger member of the family of States.

I append herewith some correspondence which may throw more light on the subject. I believe from what I know of the islands that Mr. Wight's views are correct and unprejudiced. They are certainly worthy of consideration.

HONOLULU, H. I., *May 16, 1901.*

DEAR SIR: In conversation with Mr. A. Louisson he stated that you were desirous of obtaining authentic information in regard to the cultivation of coffee and other crops adapted to these latitudes, and, having gone into this matter most thoroughly, I take pleasure in placing such information as I have at your disposal.

LOCATION AND PREPARATION OF PLANTATIONS.

Experience has demonstrated that coffee can be successfully cultivated only at an elevation of over 1,000 feet, and the best results are obtained at an altitude in the neighborhood of 2,000 feet. A deep rich soil is essential, and also a certain amount of shade. The lands in the Hamakua district above the cane belts from Kukuihaele to Laupahoehoe grow fine coffee; from Laupahoehoe into Hilo results have not been satisfactory. This is probably due to a clayey subsoil. The upper lands in the district of Kona are also suited to the cultivation of coffee. A rainfall of from 50 to 100 inches a year, evenly distributed, is essential to produce the best grades. Absence from wind is also requisite.

The first step in opening a coffee plantation is the erection of laborers' quarters. Fifteen dollars an acre will cover this expense, including suitable water containers. The next step is clearing the land. The best practice is to cut down the forest, cutting the trunks of trees over 1 foot in diameter in lengths of 8 feet, and below 1 foot in diameter in lengths of 12 feet. All brush smaller than one's wrist is best burned, but great care should be taken in burning the brush not to burn over the land. The ferns which are invariably found in forest land keep the ground moist, prevent weeds from growing, and also protect the young coffee trees against insects, and the growth of the ferns does not interfere with the growth of the coffee.

There is no doubt but that coffee grows better in the shade than in the open, the amount of shade depending on the rainfall and altitude of the plantation. In the Hamakua district 12 shade trees to the acre give the best results. Coffee trees grown in the open throw out branches close together, necessitating much extra labor for pruning; those grown in too dense shade throw out branches too far apart and the crop does not ripen well, but by placing shade trees judiciously the coffee grows sufficiently open to make the labor of pruning nominal.

PREPARING LAND FOR PLANTING.

After a forest is felled and cut into lengths, the timber should be placed in rows from 8 to 10 feet apart; holes to be dug in the space thus cleared for the young coffee trees. The best distance to space the rows is still a matter of discussion. Eight or nine feet is the most common practice.

PLANTING AND CULTIVATION.

This is a most important process, and should be done only by men who have been carefully taught this work. A peculiarity of the coffee tree is that if the taproot be not planted straight the tree will not flourish, and replanting is inevitable.

VARIETIES.

The best results have been obtained from seed known as Horner Guatemala. The origin of this seed is obscure. The variety is identical with the best grade of Java coffee. I have imported the best varieties of Java, but the Horner seed produces a coffee in every way equal to the Java in appearance, while the flavor is superior. Both the Java and the Horner coffees give trees which send out branches straight from the trunk. The Hawaiian coffee droops, and in consequence pruning and picking from the Hawaiian trees are more expensive. The quality is also inferior to either of the above varieties.

In planting coffee a great many "sports" are found, and there is no doubt that, under judicious experimental cultivation improved varieties would be discovered.

After the plantation is started, the care required for the first year is very slight. In the Hamakua district, in forest land, one man can easily look after 15 acres, the work consisting in weeding and replanting. Ten per cent is a fair estimate for replanting.

Estimates as to what cultivation ought to cost are of very little value. With the most careful management, and without making any mistakes, it costs $200 to clear an acre of land and maintain it until the trees are four years old, when the first crop is taken off.

COST OF PICKING AND MAINTENANCE.

Having never cultivated coffee over four years old, the cost of keeping up a plantation after this time is unknown to me, but it should not exceed $3 per acre per month exclusive of picking and interest on the investment.

The cost of picking, I know from experience, will amount to between 5 and 10 cents per pound of market coffee, 7½ cents per pound being a fair average. (Pl. XXVIII, fig. 2.)

Cleaning, drying, and transportation will amount to about 3 cents per pound more. In other words, figuring an acre of coffee ready to bear at $200, it costs 12 cents to produce 1 pound of marketable coffee laid down in Honolulu.

Our coffee is divided into several grades. The best brings about 13 cents; the poorer grades, about 9 cents per pound, the above figures representing a crop whose average value is 12 cents per pound. In the figures given as to the cost of bringing an acre of coffee into bearing the cost of superintendence has not been taken into consideration. A man cultivating his own crop would make this item nominal, whereas an expensive manager on a small plantation would make this cost greater than all others. On a well-managed plantation of 100 acres, a fair estimate for the manager's time, and the cost of a residence, would increase the price per acre $100, making the total cost of 4-year-old coffee $300 per acre.

Rainfall has a very decided bearing on the selling price of coffee. Where the rainfall is regular throughout the year a large berry of regular shape is produced; where the rainfall is spasmodic the berry is small and irregular in shape. A large regular-

shaped berry will bring from 1 to 2 cents per pound more than a small misshaped berry, although the cup qualties of the coffees are precisely the same.

The selection of a location for a coffee plantation is a most important consideration, and a newcomer should under no circumstances decide this matter without the advice of a successful cultivator.

Being thoroughly familiar with the island of Hawaii from Kohala to Kau, I can say the land of Hamakua, immediately back of the Hamakua and Paauhau sugar plantations, lying at an elevation of from 1,500 to 3,000 feet, offers the best natural advantages of any district; and should you contemplate establishing an experimental station for the cultivation of coffee, I would suggest that you select a location in the Hamakua district.

PRESENT STATUS OF THE INDUSTRY.

With the most favorable locations and with the best management, coffee can not be produced for less than 12 cents for the average value of entire crop laid down in Honolulu, and this grade will bring an average of 13 cents in San Francisco. Inasmuch as coffee is sold on sixty days' credit, and from three to four months are consumed in selling a crop, the present San Francisco price is barely equal to the cost of production, and unless the industry is encouraged by a protective tariff in the immediate future the entire business so far as the production of the better grades is concerned will be stamped out.

Considerable areas throughout the islands of uncultivated coffee will be picked in a desultory way by Japanese and Hawaiians. The flavor of this grade is very inferior, and the method of curing is crude, and in consequence these coffees are bringing to-day in the San Francisco market from 8 to 10 cents per pound, and a certain irregular production of this grade will be continued under any circumstances.

The cultivation of coffee is one of the most interesting of agricultural pursuits. Mr. J. M. Horner, who is largely engaged in sugar and coffee, once told the writer that when he was thoroughly tired out in the sugar fields, work in the coffee brought back health, strength, and courage.

The altitude at which coffee thrives is best adapted for the production of food crops—corn, potatoes, and garden vegetables can be grown most successfully in connection with coffee, and by the cultivation of forage crops a fine grade of butter and beef can be produced; poultry also flourishes.

The coffee industry of the islands has gone from bad to worse. The situation to-day is such that the market prices of our coffees are below the cost of production, and while a few of the plantations may struggle along for a year or two longer, unless speedy relief be furnished the end is inevitable.

The point where the most favorable location and careful management will enable a coffee plantation to live has been passed, and if you will trouble yourself to inquire at the banks you will find that it is absolutely impossible to obtain a loan on a coffee plantation beyond the bare value of the land, and even then the banks are reluctant to make advances.

Up to the time that we were annexed to the United States the Hawaiian duty on coffee protected our market to the exclusion of all other coffees, but since that time low-grade coffees have been introduced from the United States, and in consequence the Honolulu market has been materially affected. I am not in a position to give statistics, but I believe that at least one-third of the Hawaiian trade in coffee is supplied from abroad, and a representative of a large wholesale house in San Francisco told me that his sales of coffee in these islands were largely increasing.

Referring to your inquiry as to the amount of lands available in the islands for the cultivation of coffee, I am not able to give you any approximately correct information for the reason that certain localities which appear to have every natural advantage will not grow coffee when the actual test is made, and that other localities which

present a very unfavorable appearance give very fine results. But I should estimate that on all of the islands there is in the neighborhood of half a million acres which could be utilized, either wholly in the production of coffee or of coffee in combination with other crops.

J. F. Brown, commissioner of public lands, in 1898 estimated that there were 76,270 acres of Government land suitable for coffee, and there must be at least five times this amount of land held by corporations and individuals. In making this estimate I have taken into consideration only lands above the cane belt—say those lying at altitudes of from 1,000 to 5,000 feet.

Immediate relief to the present situation could be afforded if the United States Government would give our coffees preference in supplying the needs of the Army and Navy, and I would suggest that it might be advisable to bring this fact before the Department of Agriculture at Washington.

MISCELLANEOUS CROPS.

Corn, potatoes, sweet potatoes, cabbage, lettuce, turnips, beets, and Portuguese onions can be fairly successfully cultivated, the one drawback being the cutworm. I have seen a quart of cutworms dug out of a surface 6 feet square, and it is needless to say that under such conditions nothing can be cultivated.

All of our Hawaiian lands produce natural forage crops when the forest is first cleared, viz, honohono (*Opelismenus compositus*) and pualele (*Sonchus oleraceus*), but after the land has been cropped for a certain length of time these plants can not be depended upon, and sorghum, bunch grass, or alfalfa should be planted.

Good dairy stock can be purchased from ranchers, although the price is very high. Cows give as much milk as in California, but it is not as rich nor is the butter as sweet and waxy as that of California. Beef, butter, and hogs command ready sale at high prices at all times, and the possibility of maintaining a dairy exclusively on cultivated forage crops is well worthy of your attention.

Speaking in a general way, after a family has been located six months on a coffee plantation, the living expenses of that family should not exceed $15 per month, provided the cutworm problem can be solved.

The agricultural possibilities of these islands are untried, but the first step in developing the lands of higher altitudes should be the placing of some staple adapted to this section on a firm basis, and this can best be done with coffee. Coffee should become one of the staples of these islands. But unless it be protected to the same extent as rice and sugar, it is folly for anyone to consider the cultivation of this crop.

Neither corn, potatoes, nor garden vegetables can be profitably cultivated to any great extent owing to the lack of a market. The only regular source of demand is the city of Honolulu, and as the white population are the only consumers of European vegetables, this demand is limited; consequently any supply over that required by a population of 10,000 can not be consumed and an extensive production of vegetables is bound to end in failure through lack of a consuming market.

What is known as the Kula district on Maui is used exclusively for the cultivation of corn and potatoes, and although the area cultivated does not exceed 1,000 acres, at times crops have been allowed to rot in the fields owing to the prices having become so low that it did not pay to gather them.

Mr. R. H. Long, who has raised vegetables successfully in Petaluma for the San Francisco market, has undertaken the cultivation of cabbage, tomatoes, cauliflower, celery, beets, turnips, and other garden truck, in the districts of Weimea, Hawaii, and while he has met a number of reverses through cutworms and heavy storms, he is still sanguine as to the ultimate success, but he expects to supply all the markets on these islands from a farm of 100 acres.

In my opinion the fruits of the Temperate Zone can not be profitably cultivated to any extent owing to the small consuming population of the same. A considerable market for oranges ought to be found here and a plantation of 400 or 500 acres should succeed, but I doubt if any considerable foreign market could be found. On the other hand, coffee, gutta-percha, India rubber, cocoa, cacao, cocoanuts, and products which are naturally adapted to this latitude, which will keep indefinitely, and which are used universally all over the world, seem to me more desirable crops.

Yours, very truly, C. S. WIGHT.

Mr. JARED G. SMITH,
Commissioner of the Department of Agriculture,
Honolulu, Island of Oahu, Hawaii Ter.

At my request my assistant, Mr. T. F. Sedgwick, has prepared brief statements upon the present condition of a number of important industries, which I submit herewith. It is shown that of such important food crops as potatoes and rice not enough are grown to supply the local demands, and of taro, which is one of the important plants, being used both as bread and as a vegetable, the supply is gradually diminishing, owing to a number of causes.

A cooperative experiment in taro growing was started with Judge Wilcox of Honolulu about August 15. A taro patch was selected in which almost every plant was affected with "blight," and experiments are now being made to find methods by which the disease can be checked. Losses in the yield of taro have in some cases amounted to 90 per cent of the crop. Taro being the staple food of the native Hawaiians, these experiments, if successful, will be of great and immediate practical value. (Pl. XXIX.)

POTATOES.

Formerly potato growing was an important industry, potatoes standing at the head of the list of exports. In 1849 the number of barrels exported was 51,957, but at the present time the local demand is almost wholly supplied by importations, which amount to 1,500,000 to 2,000,000 pounds per annum. The retail price varies from 1½ to 4 cents per pound.

It is estimated that there are at least 6,000 acres of land well adapted to the growing of potatoes. The best potato land is in the Kula district, island of Maui, on the slopes of Haleakala, the yield varying from 1½ to 4 tons per acre. The soil is fine, almost a powder, quite deep, and does not crack. The tubers are smooth and free from pimples and present a good appearance in the market. The size of the potato is inferior, but this is due to poor selection and bad cultivation, as there are records of specimen potatoes 16 inches long and 11 inches in circumference. The quality is excellent, and when properly shipped brings a good price in the market. Good potato land is also found in the vicinity of Kawaihae, island of Hawaii.

HAWAII STATION—RICE AND TARO IN PANOA VALLEY.

Of late years the industry has diminished to a fraction of the home consumption. Most of the potatoes now raised are grown by Japanese, but even they are becoming discouraged owing to the ravages of disease and the use of poor seed. The black rot of the potato has appeared, last year's crop being practically destroyed. This year there are a few struggling patches under the care of Japanese tenants. The cutworm is the chief insect enemy of potato culture.

SWEET POTATOES.

No fair estimate of the present production of the sweet potato has been made, but at one time in the history of the islands it received no little attention, as there are records telling of 50 varieties under cultivation. In 1850 the amount of sweet potatoes exported was 9,631 barrels.

It is a plant easily grown, thriving well on most parts of the islands where the rainfall is not too great. It is often seen growing around native huts in the dry and otherwise barren portions of the country, or over a coral bed where there may be but few inches of soil.

The sweet potato is propagated by cutting off the tops and planting them in a hill of dirt which is often merely the surface soil scraped together.

As an article of food, it is one of the principal vegetables and it is a deplorable fact that at the present time there is so little effort toward home production that large imports are being made, and the California sweet potato is seen in the Honolulu market as often as the home-grown product. The latter is sold at half the price of the former, the difference in price being in large measure due to inferior grading and packing for market of the home-grown article.

TARO.

The taro plant is used in making poi and as a vegetable. As it is generally cultivated as an aquatic, the sections chosen for its growth are near a water supply. The mountain streams are nearly all diverted during their course to the sea into the taro patches (rice and taro land may be used interchangeably), so the sections where taro is grown are the low plains or slopes of the valleys. (Pl. XXX, fig. 1.)

Cultivation.—The land is divided into patches varying from one-thirtieth to one-fourth of an acre. The patches are arranged in terraces separated by dykes, thus allowing the water to run from the upper to the next lower terrace.

The tops of the plants are cut when the crop is harvested, and these in turn are planted, and in time will make the new crop. It requires from ten to fifteen months for a crop to mature, the only work neces-

sary during this period being to keep the patch well irrigated and free from weeds.

The growing of taro, although local, is an occupation of much importance to the islands. Extinction of this crop by other industries would be as great a hardship to the poorer classes of people as a wheat famine would be in the rest of the United States. While formerly taro growing was an industry confined entirely to the natives, it is gradually falling into the hands of the Chinese, and fully 50 per cent of the taro is now grown by Chinese, and 80 per cent of the poi is made by Chinese.

Taro lands rent for $40 to $50 per acre per annum. The yield per acre is from 6 to 10 tons. Taro sells at from 1½ to 5 cents per pound. One grower claims that 4 acres will yield a gross receipt of over $3,000.

The production of taro is roughly estimated to be worth about $100,000 to $150,000 per annum, and thus it will be seen that the industry is one of importance and must be fostered even to the sacrifice of some others.

The supply of taro is being cut down to no little extent by the taro disease, which causes a rotting of the tuber until often the whole plant becomes useless. This disease is undoubtedly encouraged by the depletion of the soil, as taro is grown year after year on land without fertilization. In some cases the loss has been 80 to 90 per cent of the yield, while the average loss is 50 per cent. Experiments are being carried on by the experiment station relative to this disease, and so far the results are encouraging.

The growing of taro need not be limited to small sections of irrigated lands, for there are varieties that thrive in the uplands where there is plenty of rainfall. This is called upland taro, and is less subject to disease than the lowland or water taro, and the poi made from it is of superior quality. (Pl. XXX, fig. 2.) The area of land adapted to its culture is very extensive, and the output from this land would exceed that of water taro many times.

There are about 40 varieties of taro; some are suitable for cooking as a vegetable, while others are better for poi. There is room for selection and improvement in the varieties of taro.

Poi is the staple food of the Hawaiians. It is made from the root of the taro, which is boiled, peeled, and mashed to a pulp. A little water is added until the consistency is that of paste.

The older white settlers find poi a palatable article of diet, and in this connection the food problem for our new tropical possessions might be considered. Poi is nutritious and in the partly fermented condition is very digestible, thus rendering it a good food for people living in the tropics, where stomach troubles among the white settlers seem to be very common.

FIG. 1.—HAWAII STATION—WOMEN WORKING IN TARO FIELD.

FIG. 2.—HAWAII STATION—UPLAND TARO AND BANANAS.

FIG. 1.—HAWAII STATION—PLOWING FOR RICE WITH WATER BUFFALO.

FIG. 2.—HAWAII STATION—HARVESTING RICE.

FIG. 1.—HAWAII STATION—MARKETING RICE.

FIG. 2.—HAWAII STATION—DUCK POND NEAR HONOLULU.

RICE.

Rice is grown almost exclusively by the Chinese. (Pl. XXXI, figs. 1 and 2.) Its preparation for market in many sections is very crude, the flail often being used to thrash the rice, while grading is done by hand sieves, and transportation is by means of pack mules or handcarts. (Pl. XXXII, fig. 1.) New methods and modern machinery, however, are being introduced.

The market price of rice ranges from 5 to 7 cents per pound. Rice lands rent for $40 to $60 per acre per annum. The production of rice is from 30 to 43 barrels per acre, or 5,000 to 7,000 pounds. As five crops can be grown on a given piece of land in three years, the average yield per acre per annum is 48 barrels, or 8,000 pounds. The area of rice land has decreased to some extent, owing to the introduction of sugar cane on the rice lands which were available for that purpose. At the present time rice is being imported for home consumption. The largest export of rice was during the year 1887, when 13,684,200 pounds were exported. Exports of rice have diminished to about one-fifteenth of that of 1887. The imports are upward of 250,000 pounds annually.

"KLU" BEAN, OR CASSIE.

The islands offer opportunities for the encouragement of some minor industries, such as spices, vegetable oils, and aromatic plants. Among the latter may be mentioned the Cassie flower. India furnishes much of this product, and in southern France there are plantations devoted to the cultivation of the Cassie flower. In Hawaii the plant grows luxuriantly and is found along the roadsides and in rocky and otherwise unproductive sections. Experiments have proved that the quality of the flowers after proper curing equals if not excels those produced in India. The price paid for Hawaiian-grown flowers is 60 cents per pound.

DUCKS.

Duck raising, which is entirely in the hands of the Chinese, has come to be an industry of some proportions, representing about $30,000 per annum. Ducks sell for $6 per dozen. The demand is so great that almost every available pond around Honolulu is utilized as a duck pond. The Chinese are remarkably successful in rearing the birds and keeping them free from disease. A Chinaman may have over 2,000 ducks in his flock, with only half an acre for ponds and runs. (Pl. XXXII, fig. 2.)

CHICKENS AND TURKEYS.

The raising of chickens is attended with many difficulties, among which are chicken pox, roup, and chicken cholera. The mongoose, also,

is responsible for much of the trouble. Chickens flourish better in the higher localities. In earlier days chickens were apparently plentiful and sold for $3 per dozen, while now the market price is $15 per dozen, much of the local demand being supplied by imported fowls. The chicken industry, including eggs, amounts annually to $25,000 or more.

Turkey raising seems to be attended with the same difficulties as chickens. The price paid for dressed turkeys is about 30 cents per pound. In the mountains there are wild turkeys, or rather domesticated turkeys, which have found their way to the mountains and have reared broods. This seems evidence that turkeys might be raised under proper conditions and put on the market at reasonable prices.

SUGGESTED LINES OF INQUIRY.

The economic conditions of Hawaii are such that new industries can be established only with the greatest difficulty. In common with all other old insular regions there has been a multitude of serious insect and animal pests introduced, not through intent but as a concomitant of commerce. In this regard the history of Hawaiian agriculture is parallel with that of many other tropical islands, such as the Fiji Islands and the British West Indies. Plants may be introduced without their insect enemies, or insects which in their native country are kept in check by natural enemies, and parasites may here breed in enormous numbers and adapt themselves to new host plants, to the detriment of the farmer. Hawaii is full of ornamental exotics which have become weeds, and of Chinese, Japanese, Australian, American, and Old World insects which, free from all natural check, ravage alike the native vegetation and the cultivated crops. The lot of the farmer is thus in a way more difficult than in continental regions. The battle is a continuous one. The practical entomologist thus finds here a wider field for work, and although much has been done, a vast amount of work is yet to be accomplished. Some crops are abnormally free from blights and disease. Others fall a ready prey to hosts of enemies whose attacks the plants themselves are not prepared to resist nor do the farmers know how to combat. What is true of insect pests is also true of fungus and bacterial diseases. The field of investigation is a new one, hardly yet touched upon.

Lower world's prices for sugar means a narrowing of the margin of profit. With such a fall in prices and profits must come the substitution of more careful handling, better cultivation, conservation of the irrigation water (where used), and a more skillful fertilization of the soil. The Hawaiian sugar planters are prone to ignore these factors and to ascribe all of their benefits to cheap labor. If planters in other parts of the tropics can grow sugar at a profit in the open competition

of the world's markets and in spite of the American duty on this product, there is still hope for greater reward in store for the Hawaiian grower. Investigations as to cultivation and the most efficient use of water would well repay. In this connection and as an aid to the future development of this island group a comprehensive soil survey of all the agricultural lands would save to the men who are to develop the resources of the land millions of dollars. Much experimental work has been done in trying to grow this or that crop. A soil map of the islands would, in case some one crop were found which grows better here than anywhere else, indicate exactly in what other regions this crop would be most likely to succeed. There is hardly a crop cultivated in all the subtropical regions of the globe but which has been grown here at some period during the past eighty years. Fruits, nuts, dyes, tannins, precious woods, spices, vegetables, drugs, fibers, and forage plants have been grown in endless variety. The castor-oil bean is grown in Kona and finds ready sale at $60 per ton. Tea is almost a weed in Olaa and Hamakua. Vanilla thrives in Kau, and the cocoanut in Puna. There are large trees of cacao, the source of chocolate, in the city of Hilo, and the African oil palm lines the streets of Honolulu. Tobacco of excellent quality has been grown on all the islands. The opportunities for work in lines where practical agricultural benefit will result are so many that it is difficult to choose what first to undertake.

Investigations in forestry are much to be desired, but these can not be undertaken by the station without considerable increase in its resources; and, in any case, whatever investigations the station might undertake in this direction should be done in cooperation with the Bureau of Forestry.

Many of the native woods of this group are extremely valuable from a commercial standpoint, and a considerable trade in these woods, notably koa and sandal, at one time flourished. It would be well if the entire backbone of each main mountain chain of each of the islands be set apart in forest reserves under the Federal Government, in order that the native forests may be protected and preserved and that a modern and legal system of forest conservation may be carried out. The sugar plantations all depend directly or indirectly on the wooded mountain slopes for their water supply, and it is due to their owners that something be done to check the further destruction of the native forests, and also to replant large areas with trees (native and foreign) which shall in the future become commercially valuable.

The station has already attained a sure footing in Hawaii. Many inquiries in regard to local problems in agriculture have been received and answered, and the interest in the station is constantly growing. If sufficient money can be appropriated to provide a suitable permanent equipment, results will the sooner be obtained.

ANNUAL REPORT OF THE PORTO RICO AGRICULTURAL EXPERIMENT STATION FOR 1901.

By F. D. GARDNER, *Special Agent in Charge.*

INTRODUCTION.

The first appropriation for agricultural investigations in Porto Rico was made for the fiscal year ended June 30, 1901. This appropriation was $5,000, and authorized the Secretary of Agriculture to determine the agricultural conditions existing in that island with special reference to the most desirable localities for agricultural experiment stations, as well as the subjects on which the agricultural people of the island are in most immediate need of practical information, and how this need can be most economically and effectively supplied; but it did not provide for the establishment and maintenance of an experiment station. The preliminary investigation called for by this appropriation was made through the Office of Experiment Stations by Prof. S. A. Knapp, formerly of the Iowa Agricultural College, and more recently engaged in agricultural enterprises in southern Louisiana. He visited Porto Rico during the summer of 1900, and made his final report in September of that year. This report was transmitted to Congress and published as House Doc. No. 171 (Fifty-sixth Congress, second session). It contains a summarized statement regarding the climate, soil, and agriculture of the island, shows in what ways the experiment station might benefit agriculture, and recommends the establishment of a station as soon as practicable. Professor Knapp advises that the station should give immediate attention to promoting the production of larger and better crops of coffee, sugar, and tobacco, and food products for home consumption, and that at an early day work should be undertaken in horticulture, forestry, animal husbandry, and dairying. Besides conducting experiments, it should give object lessons in improved farming and should disseminate information by publications and agricultural meetings.

On the basis of this report Congress made a second appropriation ($12,000) for the current fiscal year, which authorized the Secretary of Agriculture "to establish and maintain an agricultural experiment station in Porto Rico, including the erection of buildings, the printing (in Porto Rico), illustration, and distribution of reports and bulle-

tins, and all other expenses essential to the maintenance of said station."

Though this appropriation did not become available until July 1, 1901, the writer, then assistant in the Division of Soils of this Department, was transferred to the Office of Experiment Stations April 15, 1901, and was appointed to take charge of the agricultural investigations in Porto Rico. After spending some time in such preliminary preparations as could best be conducted in Washington and vicinity, he proceeded to Porto Rico, arriving in San Juan about the middle of May. The remaining portion of the fiscal year he spent mostly in traveling about the island to familiarize himself with its people and the conditions and needs of agriculture, with special reference to the location of the experiment station and the character of experiments most desirable to undertake. During a portion of this time he was accompanied by Messrs. O. F. Cook and G. N. Collins, of the Division of Botany, of this Department, who had been temporarily assigned to this Office and sent to Porto Rico to aid in preliminary studies with reference to the determination of the best lines of work for the proposed experiment station.

As regards the location of the experiment station, more difficulty was experienced in obtaining suitable land than was anticipated. Replies to a circular letter sent to the different municipalities in the island, setting forth some of the advantages of an agricultural experiment station, and asking how much land they would donate for the purpose of establishing an experimental farm in their vicinity, as a rule, stated that the municipalities possessed no lands that in kind and amount would be suited for the purpose, and that their very poor financial condition would not allow them to purchase. Three municipalities, however, made offers of land, but on examination it was found to be either not suitable for experimental purposes or too inaccessible.

When it became apparent that the station could not be permanently located without considerable delay, arrangements were made for conducting experiments on a temporary basis. Thirty acres of land adjacent to the town of Rio Piedras has been leased, together with a large frame house which serves as a residence and office for the special agent, and also furnishes accommodations for laboratories and library. In addition to this, the local normal school has donated temporarily the use of 40 acres of land for experimental purposes. The necessary horses, mules, and oxen have been secured and a stable constructed for their shelter. A farm wagon, an ox cart, and several plows and harrows, together with garden and horticultural tools, have been secured. A portion of the land has been cleared of weeds, banana stumps, etc., and plowed. The experiments include tests of various kinds of plants, and experiments regarding the time and manner of planting, the use of fertilizers, etc. A cooperative experiment has been commenced on

a coffee plantation, with the object of improving methods of growing coffee in Porto Rico. This consists of an attempt to improve the yield and quality of coffee by selection, breeding, and propagating, and in restoring old groves by removing part of the shade and thinning and pruning. Investigations have also been begun to discover means for combating certain troublesome insects, especially the "changa," a kind of mole cricket, and various scale insects, and the fungus diseases affecting citrus fruits.

The Bureau of Soils of this Department, in cooperation with the station, has undertaken a soil survey of a portion of the island. A considerable number of different kinds of vegetable seeds have been distributed to farmers. The beginning has been made of a collection of improved farm implements and machinery of the kinds adapted to the tropical agriculture of the island. In this work the station has been greatly aided by different manufacturers in the United States. It is believed that in this way useful information regarding improved implements will be disseminated by visitors to the station.

The organization of a regular station staff has been begun, the force now including the special agent in charge, the entomologist and botanist, and farm foreman.

It is hoped that land may be obtained for the permanent location of the station in the near future and that it will be possible to greatly develop the work of the station during the coming year. Considering the large agricultural interests of the island and the variety of work which needs to be done by the station, the appropriation for its support by Congress should not be less than $15,000 per annum. In addition to this, money will be needed for the purchase of land, erection of buildings, and equipment of the station. The station will, therefore, need such financial assistance from the Territory of Porto Rico as was given in the other States and Territories.

There are no results of experimental work to be reported at this time. This report is, therefore, chiefly confined to a statement of the agricultural conditions and needs of the island as seen by the writer in the course of such an agricultural survey as he has been able to make in the space of nine months.

AGRICULTURAL RESOURCES AND CAPABILITIES OF PORTO RICO.

LOCATION AND EXTENT.

Porto Rico is situated between 65½° and 67¼° east longitude and 18° and 18½° north latitude. It is therefore approximately 5° south of the Tropic of Cancer or well within the Torrid Zone. It is roughly, 11° east and 22° south of New York City, or 12° south by 24° east from New Orleans. The air-line distance from the island to New York City

is about 1,400 miles, while the distance to New Orleans is slightly greater.

In form the island is a parallelogram, with its long axis extending almost due east and west. In extent it is 36 miles wide by 100 miles long, embracing an area of 3,600 square miles.

CONFIGURATION.

The topography of the island consists chiefly of interior mountains and coast border plains, the latter representing only about one-tenth of the whole. The formation of the island is volcanic, the rocks consisting principally of limestones, together with small amounts of granite, marble, sandstone, and serpentine. The limestone varies greatly in its character and hardness. In the interior it is usually of a blue or grayish crystalline nature, and well adapted for burning into lime, although but little used for this purpose. The surface of these rocks is almost entirely disintegrated, forming a soil several feet in depth, which gives to the mountains a smooth appearance and furnishes a good footing for vegetation. Along the marginal foothills the limestone is of a white and chalky appearance, and is sponge-like in texture. It is usually spoken of as coral limestone, and the cavities often contain seashells. This coral limestone gives rise to foothills, having very steep acclivities, and terminating in very sharp and jagged points. The rocks are more exposed than in the interior, but their porous nature furnishes a good footing for plants, and the hills are usually covered to their summits with verdure. These rocks are much used in the construction of roads.

The main backbone of the island extends almost due east and west and is fully two-thirds of the distance to the south side. The watershed of the north is therefore twice as extensive as that of the south, and because of the greater rainfall on the former, the rivers are more than correspondingly larger.

The coastal plain consists chiefly of level stretches of alluvial land which in places takes on an undulating aspect. In a number of places this coastal plain is broken by the mountains coming directly to the seashore. It rarely extends inland more than 5 miles and the greatest breadth usually occurs at the mouth of the larger rivers.

The interior mountain country is cut by numerous streams which ramify in every direction and give rise to deep but very narrow valleys. The river bottom lands are in small irregular areas which occur first on one side of the stream and then on the other as it sweeps the valley from side to side in its course to the sea. In many places no bottom lands are present, the valley being so narrow that it is occupied only by the rocky bed of the river.

In a few instances the valleys widen out into a considerable area of bottom lands. The most noted example of this is at Caguas, where

occurs a considerable area of level land, now devoted to the growing of sugar cane. This, however, is supposed to have been a coastal lagoon or lake, which became filled with sediment and was brought to its present elevation (about 250 feet) and position by the uplifting of the island.

The mountains, while rugged, scarcely ever exceed 3,000 feet in elevation. No topographic survey has ever been made of the island, though one is much needed, and, consequently, reliable data as to elevations are wanting. The highest eminence is attained on El Yunque, in the northeast part of the island. Spanish maps give this mountain an elevation of 4,087 feet, but other authorities give it as much less, the minimum being 3,200 feet. These mountains may be considered nothing more than the peaks of a part of a great mountain chain, which, if wholly emerged, would exceed in elevation any mountains on the North American continent. To the north the shore of the island drops off rapidly, and within less than 75 miles the water attains a depth of 4,600 fathoms, or more than 5 miles.

The elevations of Porto Rico are not sufficient to cause any marked change in temperature, but owing to the prevailing direction of the winds they have a marked effect on the distribution of the rainfall. The combined influence of soil, rainfall, and elevation, however, has a marked effect upon the character of the vegetation and makes climatology a subject of vast importance.

SOILS.

The soils vary much both in formation and texture. About the shore occurs a narrow fringe of coarse coral sand, which results chiefly from the breaking down of the coral growth that is continuously in process in the waters near the shore. This soil, with its accompanying salt-water climate, is adapted to a comparatively limited flora, which is quite distinct from that of the interior. Here the cocoanut palm, yarey palm, and the sea grape find a congenial home, and the soil seems well adapted to the growing of pineapples. Bordering this to the landward are two types of soil, viz, the mangrove swamps and the playa plains. The former are swamp areas, which are about midway between high and low tide in elevation and are, therefore, inundated to the depth of about a foot by every rise of tide. The soil is often made up of a mixture of the coral sand and the finer material which is brought down from the interior, together with much organic matter resulting from the decay of the falling leaves of the mangrove bushes, which gives to the soil a black color. The soil is necessarily charged with salt and has no economic value except for the purpose of future reclamation by diking and pumping.

The soils of the playa plains, owing to the sources of their origin, vary much in character. They are all alluvial, however, and brought

down from the interior. On the north side of the island they usually consist of sandy loam, or loam which is underlaid at a depth of 12 inches by a medium clay. They are level, and when properly drained and cultivated make excellent sugar and pasture lands. On the south side of the island this soil is much deeper and usually more sandy as well as darker in color. For the production of sugar it requires irrigation during the dry season.

Bordering the playa plains are the foothills or mountains, the soils of which are dark in color. Farther inland, however, the soil is usually of a heavy red clay. The soils are adapted to coffee, citrus fruits, bananas, tobacco, and various other minor crops, the heavy clays being especially well adapted to coffee.

The coral sands and the playa plains are so level that improved machinery could be used to very good advantage in their cultivation, but the interior country is so rugged that it prohibits the profitable use of the most of our horse machinery.

The accompanying table gives the mechanical analysis of samples of soil and subsoil from various parts of the island:

Mechanical analysis[a] of soils and subsoils from Porto Rico.

No.	Locality.	Description.	Gravel larger than 2 mm.	Organic matter.	Gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0.0001 mm.
			P. ct.	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
5918	Cayey, 5 miles W.	Tobacco land, 0 to 18 inches.	45.9	8.16	1.74	5.30	4.70	15.32	12.20	27.10	26.18
5925	Rio Piedras.....	Sandy soil, 0 to 10 inches.	Tr.	3.76	1.02	19.76	15.60	25.60	8.64	9.08	15.02
5926	.....do.....	Subsoil under 5925, 12 to 30 inches.	.7	5.14	1.66	12.28	11.46	23.00	7.80	7.10	30.98
5916	Mayaguez.....	Heavy loam, 0 to 18 inches.	2.9	11.62	.46	1.92	1.42	5.50	7.80	29.18	42.26
5917	.....do.....	Lowland, 0 to 12 inches.	2.9	11.54	.26	.50	.32	1.16	1.34	18.66	65.80
5920	Yauco, 3 miles SW.	Cane land, 0 to 12 inches.	2.5	6.74	1.16	3.30	2.40	7.82	7.42	23.30	48.20
5924	Ponce, 3 miles E..	Cane land, 0 to 18 inches.	2.4	7.32	.46	1.88	1.58	5.84	6.64	29.78	46.38
5921	Mamayes post-office.	Virgin forest, 0 to 6 inches.	Tr.	15.24	.22	.44	.46	1.24	1.28	19.46	61.18
5922	.....do.....	Good coffee land, 0 to 6 inches.	Tr.	10.06	.08	.34	.36	.70	1.04	12.74	75.32
5923	.....do.....	Subsoil under 5922, 6 to 24 inches.	.....	8.26	.00	.12	.14	.86	1.46	11.90	77.84

[a] Made by the Bureau of Soils, U. S. Department of Agriculture.

Sample No. 5918 is representative of the hillside soils of the Rio La Plata which are used for tobacco. The analysis is of material smaller than two millimeters in diameter, and takes no account of 45.9 per

cent of angular gravel or broken stone which the sample contained. This soil contains a considerable percentage of sand, which, together with the contained stone, makes it loose and friable. It admits of the ready permeation of rains, and retains moisture well.

Nos. 5925 and 5926 are soil and subsoil, respectively, from level land at Rio Piedras which has been leased for cultural experiments by the station. Owing to its sandy nature it was considered especially well adapted to the growing of annual crops, particularly vegetables. The soil to 10 inches in depth is sufficiently sandy to make it easy of cultivation, while the subsoil at 12 to 30 inches contains sufficient clay to make it retentive of fertilizers and yet sand enough to make good drainage comparatively easy.

Nos. 5917 and 5916 are from the land of the Agronomic Experiment Station, which was maintained at Mayaguez by the Spanish Government from 1889 to 1897. This land, consisting of 7 acres, is of two types—a low, level portion classed as a heavy loam and adapted to the growing of sugar cane and grass, and a hilly part classed as a red clay. The latter is a heavy refractory clay, identical with that of the best coffee lands of the interior. It contains an aggregate of 3½ per cent of sand and larger amounts of silt and clay. The content of organic matter is not real, for in soils of this character the loss in heating to 100° C., is partly due to the loss of water of crystallization. If of higher elevation and farther removed from the coast this would be typical coffee land.

Nos. 5920, from near Yanco, and 5924 from near Ponce, are from the heavier type of loam soils now used for the growing of sugar cane on the south side of the island. Their content of clay and silt is sufficiently high to demand careful management in irrigation and cultivation.

No. 5921 is the surface soil, 0 to 6 inches, from a virgin forest in Mamayes. This soil is almost wholly silt clay and organic matter. The high content of the latter is due to a considerable coating of vegetable mold, the result of the decaying leaves from the forest. This land, when cleared, will be typical for coffee.

Nos. 5922 and 5923 are the soil and subsoil from a young coffee plantation at Isolina, Mamayes. The soil is red in color and very heavy in texture. It clings tenaciously to the sidehills, which are so steep that good drainage is always afforded, and even with the torrential rains is subject to but little washing. As will be seen from the analyses, this is a very heavy soil, and in case of the subsoil contains less than 3 per cent of all grades of sand. It is considered representative of the best coffee lands of the interior. These analyses emphasize the extremely heavy texture of the mountainous coffee lands, and enable one to better understand why so little of the soil is carried away from the steep slopes by the torrential rains.

CLIMATE.

The climate of Porto Rico is characterized by a very uniform temperature, abundance of rain, plenty of sunshine, high relative humidity, and moderate to slow wind movement. The mean annual temperature for the island is about 78° F. The warmest weather occurs in July, August, September, and October, and the coldest in January and February. The difference in temperature, however, between the hottest and coldest month is only about 8° F. The changes from day to day and from month to month are so slight that they are scarcely perceptible. The greatest annual difference in temperature in different parts of the island, as determined by seventeen United States Weather Bureau stations in 1900, was only 4.8° F. The mean temperature is slightly lower in the elevated parts of the island than along the seashore. The weather is perpetual summer, with three hundred and sixty-five growing days in each year.

The annual rainfall varies greatly, attaining a maximum of 140 to 150 inches in the northeast part of the island, near El Yunque, and a minimum of about 40 inches in places near the southern coast.

The following table shows the monthly precipitation for each of four localities on the island since the establishment of observations there by the United States Weather Bureau. Prior to that period the only continuous record is one that was kept at San Juan by the Spanish Government. The mean of this station for twenty-six years is as follows: Temperature, 78.5°; rainfall, 54.51 inches.

Rainfall (inches) in Porto Rico as recorded by the United States Weather Bureau, January, 1899, to December, 1901.

Locality.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
Hacienda Perla:													
1899	7.19	3.98	6.51	18.78	6.72	11.47	10.55	9.92	15.43	16.53	28.13	4.92	140.06
1900	12.05	3.67	4.43	23.34	18.70	18.55	11.04	11.95	15.30	15.83	8.36	8.70	151.92
1901	6.07	1.85	11.03	7.05	16.26	25.34	33.58	8.19	16.10	14.16	16.43	.....	.....
Mean	8.44	3.17	7.32	16.39	13.56	18.45	18.39	10.02	15.61	15.51	17.64	.....	.....
San Juan:													
1899	2.92	.80	2.29	6.09	2.59	7.23	7.53	10.38	13.66	10.21	11.81	2.10	77.61
1900	3.93	2.13	1.57	5.92	3.83	7.53	6.33	7.00	3.05	8.11	4.50	2.39	56.29
1901	4.36	.50	4.60	.66	4.84	7.05	10.98	8.59	7.39	8.30	9.55	.....	.....
Mean	3.74	1.14	2.82	4.22	3.75	7.27	8.28	8.66	8.03	8.87	8.63	.....	.....
Mayaguez:													
1899	.....	.....	.....	.....	.....	.....	14.41	19.02	.....	8.73	3.52	1.04	.....
1900	1.49	1.06	1.21	5.44	6.14	14.03	13.11	14.02	7.44	12.47	2.99	4.20	83.57
1901	2.19	.58	5.72	.58	11.87	10.44	17.06	9.86	13.00	11.27	12.84	.....	.....
Mean	.....	.....	.....	.....	.....	.....	14.86	14.30	.....	10.86	6.45	.....	.....
Hacienda Armistad:													
1900	4.25	.80	1.00	1.10	2.80	16.30	5.50	2.20	4.80	4.46	3.83	4.22	51.26
1901	2.60	1.14	2.63	.32	6.30	4.84	.....	6.03	7.97	6.30	13.97	.....	.....
Mean	3.42	.97	1.81	.71	4.55	10.57	.....	4.12	6.38	5.38	8.90	.....	.....

A study of the above table shows that the montly rainfall goes as high as 33.58 inches and as low as 0.50. A rainfall of 10 or more inches in twenty-four hours is not uncommon. In July of the present year a rainfall of 17 inches in twenty-four hours is recorded at Hacienda Perla and of 10 inches in twenty-four hours at Adjuntas. The table also shows that the driest months of the year are January, February, March, and December. The dry season, as these months are called, varies in time and duration from year to year and also varies for different portions of the island. On the south side of the island the dry season often continues into the month of July. During the present year the fields all along the south side of the island not under irrigation were in a brown and parched condition as late as July 1.

The prevailing wind is from the northeast, and in rising to pass over the mountains it is cooled to such an extent that a part of its heavy charge of humidity is condensed and falls as rain on the north side of the island. It is for this reason that the rainfall of the north slope so far exceeds that of the south. As a rule the rains occur as showers, often torrential in character, and most frequently in the afternoon. After the rain the sun again shines and nature soon resumes normal conditions. Owing to the torrential character of the rains a large part of the water finds its way into the streams, which rush madly down the steep slopes on their way to the ocean. The streams rise very quickly and often become such raging torrents that it is impossible to cross them, and there is nothing for the traveler to do but to wait for them to subside, which they usually do in a few hours. During the rainy season, however, the showers may be so frequent that the streams will continue very high for several days, thus stopping for the time all communication between different parts of the island. Excepting on the first-class roads the streams are without bridges, and even here some of these have been destroyed by the floods and will have to be replaced at a cost of many thousands of dollars.

Fogs are very common in the mountains during the early morning and often settle in the valleys so as to entirely obscure the view of one standing on the mountain top.

As a whole the climate is healthful. There is usually a breeze, and though the temperature is uniformly high it is seldom excessively warm or oppressive. With a little care people from the temperate climate need have no fear of disastrous results from the climate. It is well to avoid the sun between 11 and 2 o'clock, for at that time of the day it is almost directly overhead and very hot.

SANITARY CONDITIONS.

In the cities and towns the sanitary conditions are very bad because of the lack of city water and sewerage, and the prevalence of vaults that have been in use for several hundred years. (Pl. XXXIII, fig. 1.)

In the larger places, however, these foul conditions are being ameliorated by the installation of waterworks and sewerage, together with sanitary plumbing.

Each house usually has a water-tight cistern, which collects the rain water from the roof that is used for culinary and drinking purposes. Before using this water is passed through an earthen-ware filter to insure its purity. Since water is so often the conveyor of diseases, especially of fevers in tropical countries, it is well to boil all water used for drinking, thus destroying all germs that it may contain.

The laundering is practically all done in the streams. (Pl. XXXIII, fig. 2.) The laundress takes her pack of clothes on her head and wends her way to the nearest stream, where she sits on a rock and washes the clothes directly in the water. The clothes are afterwards spread on the dry rocks or the near-by bushes to dry. This universal habit of washing in the streams practically prohibits the using, with safety, of river water for drinking.

The houses are usually built upon piles or posts, being elevated 2 or more feet above the ground, thus giving them better ventilation and drier conditions as well as lessening the intrusion of vermin and insects. Many of the huts of the very poor, however, are built directly on the ground and without any floors, the occupants sleeping in hammocks or sometimes on the ground.

The native Porto Rican is much opposed to the night air, and therefore upon retiring he closes all of his windows and doors as tightly as possible. As large families often occupy a single room the air becomes very foul. It is believed that good ventilation, even in the night, would be conducive to better sanitary conditions.

The diet of the people varies greatly. For the very poor it consists of what they can most easily obtain with the least expenditure of either money or energy. Native fruits that grow practically wild often form a large part of their living. Rice and beans are two staple foods, and are found on the table of the rich as well as the poor. The people who can afford it eat much meat, and oils and lard are very freely used in cooking. It seems probable that animal foods are used to a much greater extent than is conducive to the best of health, especially in so warm a climate. Vegetables and maize should replace a part of the present meat diet of the people.

Naturally very little clothing is necessary, and the children of the poor, often to the age of 10 years, dispense with it.

It is not strange that in the North, where the winters are long and cold, that some people should be unable to supply the necessaries of life, but it seems almost incredible that in a tropical country, where planting and sowing can be practiced every day in the year, and where land is plenty, the mass of the people should be poverty stricken. Such, however, is the case in Porto Rico, and the reason is not on the surface of things, but is down in the primitive foundation of society.

FIG. 1.—PORTO RICO STATION—STREET SCENE IN CAGUAS.

FIG. 2.—PORTO RICO STATION—WASHING CLOTHES.

LABOR.

The labor problem is one which the Northern man will find more or less perplexing. While the wages of laborers are low, it is doubtful after all if it will be found cheap. The agricultural laborer in Porto Rico is as a rule ignorant and unskilled. He has no interest in the work he is performing for his employer, and consequently requires constant supervision, otherwise he will either not work or will do things wrong. He has no desire to rise in the world or to accumulate a small property, even for a home, and when he gets a few days' wages ahead he prefers to stop work until he has spent them. There is much to be done in improving the energy and skill of the agricultural laborer. There are great numbers of men who know how to do nothing but wield a machete or a hoe. Many of them have never driven an ox team or harnessed a horse, and to do the latter properly would for them be an absolute impossibility. The training of these ignorant people in the use of the spade, scythe, ax, pruning knife, spraying apparatus, and the operation of hand and horse machinery means a revolution in the agriculture of the island, and an output of products never before equaled in its four hundred years of Spanish rule and history.

TRANSPORTATION.

Intimately related to the agricultural development of the island is the development of transportation facilities. This naturally divides itself into interior and exterior transportation, but it is the former which most concerns the people of the island. The latter will be provided for them when the demand for it is sufficient to justify, but the former must be provided for by the expenditure of several millions of dollars, which must ultimately come from the sources that are thereby benefited. The crying need throughout the island is for roads and more roads. At present the construction and maintenance of roads is entirely vested in the insular government, the districts, barrios, and municipalities having no responsibility in them whatsoever. Quite an elaborate system of first, second, and third class roads have been laid out for the island, but a number of years will necessarily elapse before these roads can be constructed, and even when completed there will still be an urgent demand for still further road building in order to reach all of the people.

The topographical character of Porto Rico makes road building comparatively expensive, and the torrential rains make prompt repairs and maintenance imperative or they soon go to destruction.

To give an idea of the cost of road construction in the island, attention is called to the present military road extending from the capital to Ponce and Guayama, together with a few shorter sections in various other places. These roads, built under the Spanish Government,

aggregate 157.7 miles, and cost approximately $3,485,000, or at the mean rate of about $22,000 per mile. (See Pl. XXXIV, figs. 1 and 2.)

This is all first-class road, but fully one-third of it is on nearly level country, and required very little grading. The roadbed is macadam and of excellent surface, but is usually only sufficiently wide for ox carts to pass. Since American occupancy, about $1,000,000 have been spent on roads under the military government, and the present insular budget carries an appropriation of about $700,000 for roads out of a total appropriation for all running expenses of the government amounting to only $2,000,000.

The system of roads as now planned, including those already constructed, embraces 874 miles. On the basis of the former cost, $22,000 per mile, it will require about $14,000,000 to complete the system. Under the present management, however, and in view of the fact that part of these roads are second and third class, the total cost will probably be much reduced. It would seem advisable that, for the extension of this system so as to reach all the people, the island be divided into road districts, with a superintendent in charge of each. There should be a poll tax, with the option of working out the same on the roads under the direction of the superintendent. A small amount of labor on the present bridle paths might at least make them passable, whereas they are now at times impassible on account of the lack of care. The interior of the island is filled with idle men who could work almost any number of days on the roads with very little inconvenience to themselves, and much to their own and the island's ultimate advancement.

In railways the island is quite as deficient as in roads. The steam railways consist of disconnected sections, as follows: From San Juan to Carolina, San Juan to Camuey, Aguadilla to Hormigueros, Ponce to Yauco, aggregating in all 135 miles. There is an electric-car line from San Juan to Rio Piedras, 7 miles distant, and a horse tramway in the town of Mayaguez.

There are now areas aggregating 50,000 acres of land in a body for which there are no means of getting their produce to market except on the heads of peons or backs of mules and horses. No road passable by even an ox cart is accessible to them. Such conditions place a handicap on agricultural development and confines it to lines requiring the minimum amount of interior transportation.

LAND VALUES AND TAXATION.

Under Spanish régime most of the revenues were acquired by a consumption tax, and was therefore borne by the poorer classes. Under an American administration, however, it was found advisable to make a radical change in this respect, and therefore a property tax has been

FIG. 1.—PORTO RICO STATION—MILITARY ROAD BETWEEN CAYEY AND CAGUAS.

FIG. 2.—PORTO RICO STATION—MILITARY ROAD NEAR COAMO.

levied, with a marked increase rate of internal-revenue tax on liquors, cigars, etc.

Formerly the landowners paid no tax on their holdings, and as a consequence many proprietors held large bodies of undeveloped and unused land with no expense. The present method of taxation makes the ownership of land an expense, and will probably result in causing much of the land either to be used for agricultural purposes or to be placed upon the market. Where lands are not on the market and not being bought or sold it is difficult to quote prices. In a general way, however, there is very little land that can be purchased for less than $10 per acre, even when remote from roads and without improvements. Near good roads or near the towns and cities the prices advance. Cane lands vary in price from $70 to $200 per acre, according to kind and condition; coffee lands without coffee on them from $10 to $30, and with coffee trees in bearing, from $50 to $150, according to kind, location, and improvements. There are very few coffee plantations, however, that under the present depression for that crop can not be bought for $100 per acre, and there are many that can be purchased at $60 to $70 per acre. Pasture lands range from $15 to $60 per acre, and will probably advance in price because they are often adapted to sugar, which industry is now in a flourishing condition.

The present law provides for a tax on lands and personal property of one-half per cent of their assessed value for insular purposes, and not to exceed an additional half per cent for local or municipal purposes. The assessed value is very nearly the actual or market value.

Land titles in Porto Rico are very poorly defined, and for many tracts no records are obtainable. This makes the transfer of property very troublesome and the title in lands more or less uncertain. There are considerable areas of Crown lands in the island, scattered about from the shores to the interior mountains, but the records relating to them are incomplete. A list of such lands, as given in the report of the commissioner of the interior for Porto Rico, while acknowledged to be incomplete, shows an aggregate of 100,000 acres. The Crown lands presumably belong to the Federal Government, but no action has thus far been taken in regard to their disposal. It is very essential to have a complete record of lands in Porto Rico, both private and public, put into the care of a competent office. All lands, and all future changes likewise, should be recorded. If necessary, a survey should be made establishing the boundaries of all parcels of land. When Congress takes up the adjustment of this matter it is suggested that a parcel of the public domain be designated for a forestry reserve, and that a limited area be also set aside for the experiment stations to be used for agricultural experiments.

AGRICULTURAL PRODUCTION.

Porto Rico is almost purely an agricultural country. Statistics show that of the exports during many years past 95 to 96 per cent were agricultural products. The chief exports are coffee, sugar, tobacco, and live stock, in the order named. The following table[a] shows the important exports of commodities exceeding $50,000 in value for the years 1894, 1895, and 1899:

Exports of commodities exceeding $50,000 in 1894, 1895, and 1899.

Articles.	1894.		1895.		1899.	
	Quantities.	Values.	Quantities.	Values.	Quantities.	Values.
	Pounds.	*Dollars.*	*Pounds.*	*Dollars.*	*Pounds.*	*Dollars.*
Coffee	50,507,159	11,496,082	40,243,693	9,159,985	45,328,298	5,164,210
Sugar	106,723,699	3,169,895	132,147,277	3,905,741	99,160,293	2,670,288
Molasses	15,957,253	244,466	35,219,823	539,571	[a] 3,415,058	647,373
Leaf tobacco	3,369,616	619,474	3,665,051	673,787	3,313,534	331,729
Cattle	4,306	166,212	3,674	141,816	.....	[b] 852,167
Hides and skins	762,197	63,389	646,884	53,799	.....	71,975

[a] Gallons. [b] Cattle are not shown separately; includes all animals.

Of the total exports of the island for the years 1887–1891, inclusive, 28.7 per cent went to the United States, 21.4 per cent to Spain, and 19 per cent to Cuba, with lesser amounts to various other countries, and for the five years ending 1896, 24.8 per cent went to Spain, with 23½ to Cuba, and 15.8 to the United States. Of the total imports of the island for the years 1887 to 1891, inclusive, 24 per cent were received from the United States, 28 per cent from Spain, with approximately 21 per cent from the United Kingdom, and lesser amounts from various other countries. For the five years ended 1896, the percentages are as follows: Spain, 32½; United States, 24; United Kingdom, 13. Since American occupancy, however, this order of importation and exportation has been very much modified and we find that for the year 1899, 40 per cent of the imports were received from the United States, with 20 per cent from Spain and 17 per cent from the United Kingdom, and for the same year, 34 per cent of the exports were sent to the United States, with 21 per cent to France, 13 per cent to Cuba, and only 10 per cent to Spain. During the first year of civil government, ended April 30, 1901, 80 per cent of the imports were received from the United States and 64.6 per cent of the exports went to the same source. This shows a marked increase between the trade of Porto Rico and the United States and we can safely predict that it will continue to increase until 90 or more per cent of both the export and import trade will be between the island and the States. During the years 1887 to 1891, the mean annual excess of imports over the

[a] Figures from Monthly Summary of Commerce of the Island of Porto Rico, April, 1900, War Department.

exports was $1,863,473 and for the following five years the mean was $1,090,453.

Of the imports, slightly more than 40 per cent are agricultural products, much of which might be produced on the islands, thereby reducing the amount of imports perhaps to a less value than the exports, greatly to the benefit of the island. Rice heads the list of imports, and in 1895 reached the enormous amount of 74,145,046 pounds, valued at $2,271,819. Other agricultural imports for the same year, in the order of their value, are: Hog products, $1,274,618; wheat flour, $1,023,694; wines, $431,536; vegetables, $400,660; cheese, $337,790, and canned goods, $178,536.

Of the nonagricultural imports cotton fabrics lead, with a value of $2,070,667, and are followed by fish, valued at $1,918,107.

In speaking of the present financial condition of Porto Rico, the Secretary of the Treasury reports as follows:

> Without a dollar of funded or floating indebtedness, with a current income estimated as sufficient to meet the ordinary expenses of the government, with large reserve funds to provide for unforeseen or extraordinary contingencies, and with a lighter burden of taxation upon the real economic life of the island than at any time in its past history, there seems every reason for regarding the financial future of Porto Rico as bright and auspicious.

Statistics show a small falling off in both exports and imports for the past two years as compared with those preceding 1899. This, however, is accounted for by the great damage which was done to the coffee and other industries of the island by the hurricane of August, 1899. The plantations were temporarily ruined, and the value of export coffee for the year was reduced to about half its normal, with large reductions also in sugar and tobacco. The exports of coffee for 1899 are for the calendar year, and a large amount of it is from the crop of 1898. In 1900, the coffee exportations reached the very low value of about $2,500,000. It requires considerable time for a coffee grove to recuperate after being so severely damaged. The crop for 1901 reached nearly its normal amount, but will be much reduced in value because of the very low price at which it will have to be placed upon the market. In the years preceding 1898 the island found a market in France, Spain, Italy, and various other European countries for the greater part of its coffee, at prices ranging from 20 to 35 cents per pound. During the present year, however, the price received for Porto Rican coffee averages about 12 cents, or less than half the average price for ten years preceding 1898.

AGRICULTURAL CONDITIONS.

Agriculture in Porto Rico is primitive and backward. Little is known relating to the growing of any crops other than coffee, sugar, and tobacco, and the cultural methods of these three are very poor. There

is a dearth of skilled labor and an excess of the poorest and most ignorant kind. Improved implements of any sort are rarely used. The roads for getting produce to the local markets and to the seaports are so few that the cost of transportation often exceeds the market value. The home market is limited and the facilities for export transportation are not suitable for perishable produce. Better transportation is imperative. There is need of the introduction of improved machinery as well as of seeds, plants, and animals to take the place of those that are now so deteriorated through lack of selection and proper care that they are valueless. There is a good field for the development of some of the tropical fruits by selection, breeding, and better methods of management and their introduction into good markets. Last, but not least, the people should be taught and encouraged to adopt improved methods and fit themselves for a more intelligent management of agricultural affairs. There is great need for capital for the proper development of the island's resources and there is need for American enterprise to push things. It must be borne in mind that the great mass of the people are very poor and the island is therefore not a desirable place for an American of small means to go unless he knows beforehand that he will be profitably employed. There are many more people there waiting for employment than places to be filled. Capital, however, if judiciously invested and properly managed should give sure returns at a good rate of interest. Under the descriptions and conditions of crops brief suggestions of the possible opportunities for investments in each will be given.

According to a recent estimate the agricultural lands are grouped as follows:

Acreage of cultivated and uncultivated lands in Porto Rico.

	1899–1900.	1900–1901.
Lands planted with—	*Acres.*	*Acres.*
Sugar cane	80,034	82,678
Coffee	180,289	166,164
Tobacco	15,324	13,704
Miscellaneous	104,059	201,815
Pasturage	1,206,593	1,203,206
Woodland	318,897	165,671
Brush lands	25,659	
Not cultivated		138,348
Total	1,932,855	1,971,586

The above figures are taken from the reports of Mr. Juan B. Rodriguez, in his reports to the secretary of the interior for Porto Rico. The most striking change from 1900 to 1901 is the increase in acreage of miscellaneous crops of nearly 100 per cent. The percentage of lands under actual cultivation for the first year was only 18.9 and for the last year 23.5.

Areas cultivated in principal crops in acres—from the census of 1899.

Crop.	Acres.	Crop.	Acres.
Coffee	197,031	Malangas	12,256
Sugar	72,146	Rice	8,667
Bananas	69,380	Tobacco	5,963
Sweet potatoes	37,109	Cocoanuts	5,447
Corn	18,093	Yams	2,098

These figures differ quite materially from those of Mr. Rodriguez in the above table, but it must be borne in mind that the census was taken in November and December, 1899, while Mr. Rodriguez's figures are probably for the fiscal year ended June 30, 1900. The marked difference in acreage of tobacco, for example, is probably due to the fact that at the time the census was taken the tobacco for the fiscal year had not been planted, and the acreage as reported was probably for the crop that had been harvested several months earlier.

COFFEE.

Coffee is by far the most important crop of the island, and as an article of export has exceeded in value that of all other exports combined. The cultivation of coffee was introduced into Porto Rico by emigrants from the island of Haiti. In 1768 the King issued a royal cedula giving to Porto Rico a monopoly of the cultivation of coffee, and relieving or exempting the growers from the payment of any taxes for a period of five years. In 1770 the island produced 7,280 pounds, and in 1776, 11,262 pounds. In 1850, or three-fourths of a century later, the yield had increased a hundredfold, or to 11,783,684 pounds. The lack of suitable market and the time required for coffee to come into full bearing offered very little inducement for planters to extend its cultivation, and progress was consequently slow. In 1876 the United States opened its ports to free coffee. This proved a marked stimulus to the Porto Rican grower, and for a short time large shipments were made to the States. Very little attention was paid to quality, and as the island could not compete with Brazil in price, the market remained for the latter and Porto Rico found a better market in southern Europe.

Quantity and value of coffee exported from Porto Rico during each calendar year from 1887 to 1896, inclusive.

Calendar year.	Quantity (pounds).	Values.	Calendar year.	Quantity (pounds).	Values.
1887	27,670,000	$3,391,000	1892	47,364,000	$9,122,000
1888	51,202,000	6,275,000	1893	49,250,000	11,205,000
1889	37,238,000	4,564,000	1894	50,507,000	11,496,000
1890	43,909,000	5,382,000	1895	40,244,000	9,160,000
1891	41,725,000	5,112,000	1896	58,780,000	13,379,000
Annual average, 1887-1891	40,349,000	4,945,000	Annual average, 1892-1896	49,279,000	10,872,000

The above table shows a gradual growth in the exportation of coffee for the ten years ended in 1896. In this year it reached a maximum of over 58,000,000 pounds, with a value of over thirteen and a third million dollars, or a mean average price of nearly 23 cents per pound. This is a very satisfactory showing and in marked contrast to the present much-depressed condition, which has resulted from a combination of the following circumstances: (1) The loss of the European market largely through the war with Spain and the resulting transfer of the island to the United States; (2) the great damage to the plantations by the cyclone of August, 1899, and the time and capital required to recover from it; and (3) the very crude method used in the production of coffee. By the introduction of modern methods in the cultivation of coffee and the adoption of good business methods in introducing it into the market of the States on its merit there should be a good future for coffee.

The present methods of cultivation are very primitive and consist chiefly of transplanting volunteer trees from old groves to new fields and providing shade by growing trees suited to the purpose. It is common to plant shade trees several years in advance of setting the young coffee trees, and if the shade from them is not sufficient when the coffee tree is to be set temporary shade is provided by planting bananas. The young trees for planting the new groves are volunteer plants which spring from the berries that fall to the ground and are not gathered. These volunteer trees thus represent no selection. They usually grow in dense shade, and are consequently spindling and lacking in the form and vigor which is desirable for nursery stock. These trees, usually about a foot in height, are set in the new fields at irregular intervals, varying from 5 to 10 feet, and without any regard for rows or symmetry. Two trees are usually set in each hole, so that if one perishes another will remain. If both grow, they are allowed to remain, each interfering with the proper development of the other. While the trees are small the soil is occasionally stirred about them with a machete and the weeds are cut down with this same instrument.

No attempt is made to control the form of the tree by pruning or to protect it from the ravages of insects and diseases by spraying or by other methods. The shade is often too dense, and no effort is made to reduce it by pruning the shade trees. This neglect results in tall, spindling, shapeless coffee trees that require from five to seven years to come into bearing. After the trees begin to bear volunteer trees spring up, many of which are allowed to grow until the groves often become a dense thicket, through which the coffee pickers pass with difficulty. Under these conditions the fruit is largely borne on the tops of the trees, which makes the gathering slow and laborious.

As a rule, too much shade is provided and it is a question if the

coffee could not be grown without shade. The trees best suited for the shading of coffee are recognized as the "Guamá, Guava, Moca, Hucare, and banana." The first two are considered superior to the others, a fact which may be attributed to their being leguminous trees and possibly furnishing nitrogen for use of the coffee trees.

Coffee is grown chiefly in the interior of the island on the mountain slopes and is confined largely to the west half of the island. The most prominent municipal coffee districts are Utuado, Las Marias, Maricao, Lares, Ciales, Adjuntas, Mayaguez, San Sebastian, Ponce, and Yauco, in the order named. These ten districts produce 60 per cent of all the coffee grown in the island. The Utuado district leads the list with about 17,000 acres and is nearly the center of the coffee area.

The soil conditions vary much from locality to locality, and even on one plantation wide differences often occur. Coffee is very susceptible to soil changes, and many large estates are in part only suited to the growing of coffee. This relation between soil and crop does not seem to have been well understood by the native planter, for many acres have been planted on lands that are poorly adapted to the growing of coffee solely because of the character of the soil. The best coffee is always found on soils of heavy texture, i. e., soils that are classed as clay loams or clay, and which continue heavy in texture to a depth or 3 or more feet. If the depth of heavy soil is 2 feet or less and is underlaid by stone, sand, or gravel the coffee becomes poorer, as the underlying coarse material comes nearer the surface. Sand or sandy loam never produces good coffee except it be nearly level and well fertilized. While the red clays are considered the best coffee lands, it is doubtful if the color has any bearing on their quality. The red indicates the presence of plenty of iron, which may be an important factor, but it is more likely to be the coincidence of the red color usually accompanying the heavy clays. The coral limestone along the north border of the mountains breaks down into a fertile soil well suited to bananas, citrus fruits, and minor crops, and when very fertile may produce good coffee, but such soils are not to be compared with the heavy red soils further inland. The dark-colored soils on the southern slope, especially those about Adjuntas and Yauco, are also excellent for coffee. It is claimed by some that the black soils produce greater yields than the red, but that the latter produces coffee of the best quality and trees of the longest life.

The coffee tree in Porto Rico is said to attain its maximum producing power at the age of about twelve years and continues in good bearing condition to the age of fifty years. Trees are reported at the age of eighty-two years only 2 to 3 inches in diameter, and in good bearing condition. Wherever the soil conditions are not favorable to the coffee trees they are badly infested by a leaf miner and affected by scale insects and fungus diseases.

The cyclone of August 8, 1899, wrought great damage to the coffee plantations. The terrific wind broke the large shade trees, which, falling across the smaller coffee trees, not only bore them to the ground but obstructed passage through the plantations and allowed the sun to beat down on foliage that had previously been very much shaded. The wind swayed the trees so furiously that many of their roots were either loosened or broken, while the deluge of water swept the surface and carried seaward vast amounts of organic matter, loose soil, and fertility, thus greatly depleting the soil. In places the deluge was so great that considerable areas of land, accompanied by the shade and coffee trees, slid from the mountain sides to the bottoms of the valleys, leaving only the bare rocks of the mountains. The sun poured into the groves onto slender trees that had always been accustomed to shade, and the effect on the foliage, the trunks, and the ground combined was very disastrous. As a result, the plantations, probably always showing much variation, are more spotted than formerly. What were formerly good trees are now, in many cases, barely alive, having only a few scattering leaves on their tops and bearing no fruit. The great damage caused the coffee lands through the violent washing and depletion of the soil has in many instances been a gain to the sugar planter. His fields are now more fertile than for years preceding the cyclone, as a result of the rich deposits of sediment which they received. The mean yield of coffee in Porto Rico is abnormally low, being about 2 quintals a cuerda, i. e., 200 pounds per acre. By the adoption of modern methods of planting and cultivation there is scarcely a doubt but that the yield can be doubled and it can probably be increased by five times, or 1,000 pounds per acre. On a basis of 1,000 pounds per acre, even at only 10 cents per pound, coffee growing should be very remunerative.

SUGGESTIONS FOR IMPROVEMENT.

Improvement of the coffee plantations will be attempted along two lines: First, the improvement of the old groves by reducing the shade, thinning and pruning the trees, and giving cultivation and fertilization; second, the adoption of a more rational system in the planting and care of young groves. That too much shade is used now is shown by the fact that the best and most productive coffee trees occur about the margin of the plantations or in open spaces where the shade is incomplete and where, for a portion of the day at least, the coffee trees enjoy the full sunlight.

The statement that coffee can probably be successfully grown in Porto Rico without shade does not mean that the shade can be all removed from the present plantations, nor that the young trees can be transferred from the shade of the old groves to the full sunlight of

new fields without practically all perishing. Such a radical change would result disastrously to the plants.

In reference to new plantations the first step should be the selection of seed with reference to the improvement of the trees. Seed should be selected from the vigorous, best-formed and most productive trees. It should then be planted in suitable seed beds provided with artificial shade which can be removed by degrees. As the young trees grow, the shade should be gradually removed as they seem able to adapt themselves to the sunlight. If the shade can be all removed without injury to the young trees they can certainly be transferred to the fields without great loss and will probably continue growing without shade. Only the vigorous and well-formed plants should be planted, and all should be planted on soils well adapted to the production of coffee. Planting should be made in conformity to some system. The trees should be set in rows, at least one way, and at a uniform distance of about 7 feet apart. If the land is steep a small terrace should be made about the tree. As good and thorough cultivation should be given as is consistent with the slope of the ground and the character of the rainfall. A high state of cultivation might permit washing of the soil and consequent damage by loss of fertility and would be worse than no cultivation. The trees should be pruned to some system in conformity to its nature of growth and the convenience of gathering the coffee. If there is a tendency to grow too tall they should be topped.

Such a system should not only make a much finer appearing plantation than the old haphazard way of doing, but the superior trees should reach a bearing age earlier and produce far more than under the old method. On the above basis an acre would contain 889 trees, which at the low estimated yield of 1¼ pounds of coffee for each, would give 1,111 pounds per acre. Such a yield in comparison with the present one of 200 pounds per acre would certainly be very satisfactory and justify the additional expenses involved by the improved method.

The above method is being tested by Mr. J. W. Van Leenhoff, of Isalina, in cooperation with the agricultural experiment station. While the indications are thus far good, no definite assertions can be made as to the success or failure of the method until the trees approach a bearing age.

If the ground needs a covering in order to prevent its washing, it is the purpose to sow some low-growing leguminous crop, keeping it cut away from the immediate vicinity of the young trees and using the cuttings for market. If the crop can not be economically used for forage it should be allowed to decay on the ground, thus increasing its fertility.

MARKET.

Low prices for coffee are responsible in part for the present depression to the industry in Porto Rico. Every effort should be made to introduce the coffee into the States on its merit under the name of "Porto Rico." The coffee is of excellent quality and when known it will undoubtedly replace a part of the fancy trade that is now supplied by Mocha and Java. This can be brought about by organization and a systematic handling of the product.

SUGAR.

The production of sugar in Porto Rico is at present in a very flourishing condition, and considerable capital from the States is being invested in lands and in the construction of large "centrals." It is estimated that the amount of export sugar for 1901 will reach 100,000 tons.

The area of land suited for the production of sugar is capable of being more than doubled, and by the introduction of better machinery for the extraction of the sugar and better methods of cultivation of the cane, it is safe to say that the output of sugar by Porto Rico will reach a maximum of about 300,000 tons annually.

Quantity and value of sugar exported from Porto Rico during each calendar year from 1887 to 1896, inclusive.[a]

Calendar year.	Quantity (pounds).	Value.	Calendar year.	Quantity (pounds).	Value.
1887	178,116,000	$5,068,000	1892	148,364,000	$3,897,000
1888	136,658,000	3,888,000	1893	94,992,000	2,481,000
1889	140,236,000	3,990,000	1894	106,724,000	3,170,000
1890	128,289,000	3,650,000	1895	132,147,000	3,906,000
1891	106,029,000	3,017,000	1896	122,946,000	3,604,000
Annual average 1887–1891	137,866,000	3,923,000	Annual average 1892–1896	121,035,000	3,484,000

[a] Table from Bulletin 13, Section of Foreign Markets, U. S. Dept. of Agriculture.

The above table shows that the heaviest exportation of sugar occurred in 1887; that it steadily decreased for a number of years thereafter, reaching a minimum of about 95,000,000 pounds in 1893, with a value of less than half that of the year 1887. The average exportations for the first five years are considerably greater than for the last five. In addition to sugar, molasses has also been exported to an average value of about $500,000 annually. At the present writing there are many old sugar estates that have been abandoned, the lands turned out to pasture, and the buildings in a state of ruins. These estates were mostly limited in extent and equipped with old machinery, which was not at all suited to carry on high-grade manufacturing of sugar. The lands were often too wet to give good results, and this, together with

FIG. 1.—PORTO RICO STATION—NATIVE PLOW.

FIG. 2.—PORTO RICO STATION—HARVESTING SUGAR CANE.

the poor equipment, has given rise to their abandonment. With better machinery and adequate land drainage, all of these abandoned estates will undoubtedly be again planted to sugar in the course of a few years. The abandonment of these estates has undoubtedly caused an increased activity in the production of live stock, and we find, therefore, that the value of live-stock exports has increased from $142,000 in 1895 to $852,000 for the year 1899.

The great damage caused to the coffee lands by the cyclone of August, 1899, through the excessive washing and consequent depletion of the soil fertility, was a great benefit to the sugar lands. A considerable part of the sediment carried by the deluge of water which spread over and inundated the most of the low lands was deposited there, often to a foot in depth. This rich deposit has in a great measure restored the sugar lands to their former fertility.

Notwithstanding the prosperous condition of the sugar business and the fact that its management is in a more advanced stage than that of almost any other product of the island, there is still room for great improvement in both its cultural and manufacturing aspect. (See Pl. XXXV, figs. 1 and 2.) The cane fields are usually well planted and kept comparatively free of weeds, but the cost of growing an acre of cane laid down at the mill, $40, is much greater than it should be. This price is, of course, for the first year, and includes the cost of plowing, planting, and cultivation as well as that of harvesting. It is a common practice to grow several rattoon crops, and these cost much less for production, because no plowing and planting are required. The yield from the rattoon crop, however, is less than for the first crop, and grows less and less each year. It is not uncommon to allow fields to produce four or five consecutive rattoon crops, and instances are recorded where as many as twenty have been grown. A reduction in the cost of planting and harvesting the first crop will tend to reduce the number of rattoon crops, and thereby increase the average yield. The number of rattoon crops allowable depends entirely upon the relative profit to be derived from them.

The drainage of the cane lands is often insufficient to give good results, and when good drainage is provided it is in the form of open ditches, which are expensive to keep in repair. A more rational, satisfactory, efficient, and, in the long run, cheaper method would be to underdrain the cane lands by the use of tile drains. Tile drainage once well installed would last for practically all time to come. It would do away with the annual cost for reconstruction and repairs of ditches, and, besides being more efficient in restoring to cultivation the areas formerly occupied by ditches, it would also facilitate the use of more improved machinery for cultivation. The planting season for cane extends over a considerable portion of the year. The large plant-

ing, or "grain culture" as it is called, takes place in October and the canes are harvested fifteen months later. Plantings are also made in February, March, April, and May, the canes being cut a year later. The harvesting and grinding season continues from January to June, a period of about five months. The seed cane planted for the "small culture" in February to May consists of the top two or three joints cut from the cane that is being harvested for sugar. The cane at this season of the year is said to be so ripe and dry that only these top joints are capable of producing new plants. The seed for the "grain culture" is obtained from the early plantings of the year, and in this case the whole cane is used for seed, it being so green that all joints will produce new plants.

No efforts are made toward improving the quality of cane by selection. Presumably, there are as great possibilities in improving cane as has been realized in the case of sugar beets during the past ten or fifteen years.

Two systems of planting are in vogue. On the north side of the island, where the rainfall is abundant, irrigation is not practiced and drainage is essential. There the land is plowed into ridges about 8 feet wide with deep furrows between. On each ridge two rows of cane are planted. Large, shallow holes, about 6 inches deep and 15 inches square, are made at intervals of about 2½ feet, and the pieces of seed cane placed in the bottom of them and covered with soil to the depth of about 1 inch. Usually the lower end of the cane is covered deeper and the upper end frequently not covered at all. After planting all further cultivation is done with the hoe. The weeds are cut from between the rows and hills and pulled from among the young plants. The soil is gradually worked around the young plants at each hoeing until the holes are filled nearly level with the remainder of the ridges. The number of hoeings required to keep the field free from weeds varies somewhat, but is seldom less than four. The canes stool out, and in about five months so completely shade the ground that weeds will no longer grow and no further attention is required until harvest time.

On the south side of the island, where the rainfall is scanty and where irrigation is imperative for the successful growing of cane, the land is plowed level. Furrows about 6 inches deep are run at intervals of about 4 feet, in which the cane is planted. The covering of the cane is shallow, the same as in the former method, and the cultivation largely done by hand. In irrigating the water is passed down these furrows, thus coming first in contact with the plants. This system of planting seems superior to the one practiced on the north side of the island. The furrows in which the canes are planted are more cheaply made than are the holes used for the same purpose, which are made by hand. The absence of surface ditches and the level surface of

the ground facilitates the use of machinery in cultivation, although but little is used, even on the south side of the island.

It is recommended that for all lands needing drainage it be supplied in the form of underground drains; that the land be plowed deeply with good plows and at such time that it is not too wet; that the cane be planted as a continuous row in furrows, and that a large part of the cultivation be done by using horse machinery and giving much the same cultivation that is used in the case of corn in the Mississippi Valley. By replacing much of the hand labor with improved machinery the cost of growing cane should be much reduced. In this connection careful attention should be given to the selection of healthy seed and of canes having a high sugar content.

In order to maintain good physicial and fertile conditions in the cane-growing soils they should receive judicious management. At present the lands are often plowed and hoed when too wet, and much injury done to its physicial properties. Few crops take more from the soil in the way of fertility, especially of nitrogen, than a good yield of sugar cane, and much care should be exercised to restore this loss. If necessary the lands should be given periods of rest and be planted to cowpeas or some good, suitable leguminous crop that can be plowed under, thus restoring the loss of nitrogen. The application of barnyard manure and of commercial fertilizers may be profitable if they can be secured at a cost not too great.

MANUFACTURE OF SUGAR.

For the most part the methods of manufacturing sugar in Porto Rico have been crude and wasteful. The mills are usually small and lacking in machinery of recent design and sufficient strength to extract all of the juice from the cane. The juice is usually evaporated by the open-pan system, and besides requiring more time and fuel than the vacuum system it produces only a low grade of muscovada sugar. The imperfect removal of the juice leaves the bagasse too wet to be at once burned, therefore it must be hauled away from the mill and spread out to dry, after which it is placed in sheds in order to keep it dry for fuel. Where efficient machinery is employed the juice is so completely removed that the bagasse can be at once burned. In the latter case the bagasse leaves the second press and goes directly to the furnace on a carrier, so that there is no handling of this material required. The bagasse furnishes sufficient fuel to run the entire plant.

The need of large "centrals" with improved machinery has been realized, and a general movement is on foot to organize the districts, do away with the old mills and secure new ones, by which more and better sugar can be obtained from the cane at a less cost.

TOBACCO.

Tobacco has for many years ranked third among the export crops of the island, and at the same time has supplied a comparatively large home demand. It is the exception to find a Porto Rican man who does not smoke, and many of the women, especially of the middle and lower classes, also enjoy the cigarette and cigar. The manufacture of tobacco into cigars and cigarettes is probably of far greater magnitude than the manufacture of any other single commodity on the island.

Quantity and value of tobacco exported from Porto Rico during each calendar year from 1887 to 1896, inclusive.[a]

Calendar year.	Quantity (pounds).	Value.	Calendar year.	Quantity (pounds).	Value.
1887	7,633,000	$1,089,000	1892	4,207,000	$737,000
1888	3,347,000	478,000	1893	4,208,000	774,000
1889	7,736,000	1,104,000	1894	3,370,000	619,000
1890	3,984,000	569,000	1895	3,665,000	674,000
1891	5,287,000	755,000	1896	2,220,000	408,000
Annual average, 1887–1891	5,597,000	799,000	Annual average, 1892–1896	3,534,000	642,000

[a] From Bulletin 13, Section of Foreign Markets.

The above figures for the ten years 1887–1896 show a decline in the exportation of tobacco. Previously the manufactured tobacco was practically all consumed at home, but at present there is quite an export trade with the States in cigars and cigarettes, and a larger percentage of the total product is now manufactured than formerly. While the annual amount of tobacco exported has declined, the price per pound has increased from an average of about 14 cents in 1887 to 18.4 cents in 1896.

The crops for 1900 and 1901 are in large part still on hand, a fact which tends to keep the price down and gives no incentive for increasing the acreage. The 1900 crop consisted of about 15,000 acres, which yielded only 300 to 600 pounds per acre. While tobacco of good quality is grown, yet there is a lack of skill in curing and fermenting it, and the people are in special need of instruction along these lines. The lands recognized as being best for tobacco are largely along the Rio La Plata. Of the tobacco districts, Comerio leads with an area of 2,000 acres, Camuy follows with an area of 1,039, and other important districts are Cidra, Naranjita, Yauco, Isabela, Aibonito, and Caguas, in the order named.

The preparation of the land for the seed beds usually takes place in August and September, and the seeds are planted from a month to six weeks later. The plants are transplanted to the fields in December and January, and require eighty to ninety days to come to maturity. The first crop of tobacco is therefore harvested in March or April. Suckers at once start from old stumps, and in from four to six weeks

another crop is ready to harvest. This second crop is much inferior to the first one, and is largely used for filler purposes. In many instances even a third crop is harvested, but it is very poor in quality and of little value except for cigarettes.

While some tobacco of excellent quality has been grown in Porto Rico, it is not known in United States trade. Formerly much of this class of tobacco was exported to Cuba, and part of it was undoubtedly shipped from there to the States.

Tobacco is a quick crop and one which should play an important part in giving early financial relief to the people of the island. By the introduction of improved methods it should offer good opportunities for investments and bring prompt and large returns on the capital invested.

The United States Department of Agriculture proposes to send two tobacco experts to the island to spend the greater portion of the next fiscal year in investigating the tobacco industry. They will begin with the planting of the crop and conduct experiments relating to all phases of the subject, from the beginning to the finish. These experiments will deal with the curing and fermenting of the product as well as the growing. This is an important work for the people of the island, and will begin with the next crop season.

CITRUS FRUITS.

While coffee, sugar, and tobacco are practically the only crops of export, many others are grown in a small way for home consumption. Many of these minor crops are not grown in sufficient quantities to supply the home market. Rice and potatoes, which are imported in large quantities, might well and profitably be grown to a greater extent at home. There is also great need of more diversity in the export crops. With so few crops for exportation a failure in one means a great reduction in the income of the people. The injury to the coffee industry by the cyclone of August 8, 1899, is a striking example, and illustrates the need of other export crops. The great reduction in the coffee receipts has caused untold suffering. Thousands of poor people who formerly were employed on the coffee plantations were thrown out of employment, there being nothing else for them to do. Many were supported by the coffee planters in order to tide them over until the groves should again come into bearing.

The production of citrus fruits will undoubtedly make a desirable and important addition to the export crops. Oranges, limes, and lemons are grown in a small way in nearly all parts of the island, and indicate that by the introduction of improved methods there will be a very good future for this branch of fruit culture. At present there are no groves planted with regularity, pruned, and cultivated. The trees are planted, a few here and there, about the buildings of the

plantations, and are given no particular attention. They are seedlings, and in the case of oranges represent all grades and conditions from the small sour fruits with many seeds and an abundance of rag to the large sweet fruit with little rag and few seeds. The range is from worthless fruit to that which is of excellent quality, but the latter occurs in very limited quantity. As a rule the oranges contain too much rag and too many seeds, and it is difficult to get together a uniform lot of any considerable quantity for shipment.

Two kinds of oranges are grown, the sour and the sweet. The experience thus far gained by those who are starting in the orange-growing business is that the sour one forms the best stock on which to graft improved varieties.

The growing of oranges in Porto Rico by improved methods is in the experimental stage, and it will require several years of systematic investigation to ascertain just what are the best varieties to use in planting, what are the best stocks on which to graft, how and when is the best time and methods to graft, what type of soil is best adapted to growing oranges, and many other allied questions.

If possible to do so, it would seem desirable to grow an orange that will mature earlier than do those of Florida and California, thus getting them into the early market when the price is good. Better transportation facilities are needed, but such will undoubtedly be supplied when the demand is sufficient to justify it.

There are several fungus diseases and scale insects which attack the orange trees, and it will be advisable for all that are importing stock for whatever purpose to guard against the introduction of diseases or insects not already on the island. Probably a law should be enacted providing for the inspection of all nursery stock introduced into the island, and requiring all infected material to be thoroughly fumigated. In the Tropics, where the breeding seasons are not checked by cold weather, both diseases and insect pests take on the most virulent form and especial care is required to keep them in check.

THE AGUACATE, OR ALLIGATOR PEAR.

This valuable fruit occurs in all parts of the island and is quite an important fruit for home consumption. During its season it can be bought in the markets at from 1 to 3 cents each while in the States it often sells at 50 to 75 cents per fruit. The trees are large and in a general way resemble the pear trees of the States. They occur scattered about here and there, growing in almost a wild state with no cultivation, pruning, or care. The fruits are large and pear-shaped, usually weighing from a pound to a pound and a half. When ripe the green skin, about one-eighth inch in thickness, separates freely from the fleshy pulp, which is the edible part. A large nut or seed

FIG. 1.—PORTO RICO STATION—BANANA BEARING FRUIT.

FIG. 2.—PORTO RICO STATION—GATHERING COCOANUTS.

in the interior also separates freely when the fruit is cut in half. The fruit contains about 10 per cent of oil, has a nutty flavor, and is quite nutritious. Americans are usually very fond of it. It is eaten raw in much the same way as a cantaloupe or is used in the form of a salad with a dressing.

With the present facilities it is impossible to ship the aguacate to the States without a large loss, but with better shipping facilities and a knowledge of the shipping possibilities of the fruit there should be a good future in growing aguacates for export to the States.

MANGOES.

This fruit, like the aguacate, occurs in nearly all parts of the island, but is more common and cheaper. The trees are large and sturdy, giving a very dense shade. The fruits ripen during the months of May, June, and July, and are eagerly eaten by the natives. They are kidney shaped, about the size of an apple, and when ripe have a yellow or golden color, often with a rose-colored cheek. The fruits vary much in size and quality and are susceptible of great improvement. They have a large seed or nut and the pulp surrounding it is rich and juicy. It has a flavor of turpentine, and owing to the large amount of fiber which some of them contain, some one has humorously described it as resembling a ball of yarn soaked in turpentine. There is a good opportunity of improving the quality of this fruit and creating for it a good demand in the States.

BANANAS.

Bananas grow almost spontaneously in all parts of the island but are not exported. (Pl. XXXVI, fig 1.) There are several varieties grown and they form an important part of the food of the natives. Several kinds of what are known as plantains are cooked green and used by the natives. They take the place of bread in a large measure. The red banana, the ladies' finger, the peach, and the ordinary banana of our commerce, are common and used by many. They sell in the interior very cheaply, often as low as a cent per dozen. Many bananas are grown as coffee shade, and in such localities the fruit often goes to waste or is used as pig feed. For its best development the banana requires a sheltered locality and moist atmosphere. Where strong winds prevail the leaves become riddled and fail to perform their functions. The best bananas in the island are in the interior among the mountains and in other sheltered localities.

There is no reason why the banana should not be greatly improved by selection and proper cultivation, and be made an important factor among the export tropical fruits. (Plate XXXVII, fig. 2.)

GUAVA.

The guava grows wild and often takes possession of the pastures. It is manufactured into jelly and a paste, both of superior quality and flavor, which command good prices in the States. The guava is a bush, and the fruits ripen in August, September, and October. They are relished by the cattle, and the numerous seeds being small and hard, are not digested but are scattered about the fields and thus distributed.

This fruit, by selection, pruning, and cultivation, can undoubtedly be greatly improved in quality and productivity. It is one of the fruits for which there is already an established demand, and one which can be manufactured at home, thus giving employment to many, and at the same time not requiring any transportation facilities other than those now in operation.

PINEAPPLES.

Pineapples of fine size and excellent quality are grown in many parts of the island. They do best on the sandy lands about the coast or on the stony hill lands of the interior. They require good drainage.

There are three principal varieties now grown: "Pan de azucar" (literally, sugar loaf), "Carbezona" or "Porto Rican," and "smooth cayenne." The first named is the sweetest but usually contains much fiber, the second has a white meat, is subacid, and of pleasant flavor. It is large and comparatively free from fiber. The third was probably introduced from Florida but is not much grown.

Pineapples are but little exported, but with proper facilities might well become an important export crop. By the introduction of the right sorts for canning purposes a cannery might be started and do a good and profitable business.

COCOANUTS.

Cocoanut palms grow best on the coral sands bordering the coast, but often occur in the interior. (Pl. XXXVI, fig. 2.) Those in the interior, however, do not bear so early nor so well. The coast conditions, which combine a level, wet, sandy soil with the salt-laden atmosphere, seem to be the typical conditions for the production of nuts. The trees are easily grown, and require but little care in the way of cultivation. They begin to bear in from 5 to 7 years, and at 10 or 12 years of age often produce as many as 200 nuts per tree annually. (Pl. XXXVII, fig. 1.) The nuts are much used for home consumption by the natives for "cocoa de agua," and are exported to the valuation of about $10,000 annually. The cocoanut lands are limited in extent, and might be used for the combined purpose of growing pineapples and nuts.

FIG. 1.—PORTO RICO STATION—COCOANUT GROVE.

FIG. 2.—PORTO RICO STATION—MARKETING BANANAS.

CACAO.

The requirements of cacao are so similar to those of coffee that it should do well on the island. Plants of it are found here and there, and, as a rule, are doing well. It may become an import crop in the course of a few years.

FIBER PLANTS.

The two principal fiber plants are the maguey and the emajagua. The former is a species of agave, or century plant, and the leaves often attain a length of 8 or more feet. When blooming it sends up a flower stalk to a height of 30 feet or more. The fiber is much used in the making of rope, belts, hammocks, etc. The latter is a shrub and the fiber part is the inner portion of the bark. It is much used for making coarse ropes and baskets. There are other fiber plants on the island which are not much used, and it seems very likely that the abaca, a species of banana from which the manila hemp is obtained, would thrive and become a profitable crop for the island.

Twenty or more years ago some cotton was grown on the island, and remnants of it still remain in the form of occasional small cotton trees. During the past year a certain cotton company in the States has been experimenting with cotton in various parts of the island. They have planted every month in the year and have arrived at favorable conclusions, but have not made public the results of their investi gation. My personal observation leads me to believe that the best season to plant is June or July, thus having the cotton mature in the early part of the dry season, which usually begins with December. The beginning of the dry season, however, is rather uncertain, and may be delayed by weeks or even months.

There are many other plants of economic value, some of which are native and others which might be introduced that would be valuable crops for the people of the island, but space will not be taken for further mention of crops.

MINOR CROPS.

Minor crops, such as rice, corn, potatoes, yams, beans, peas, tomatoes, melons, and a variety of other vegetables, are grown in a limited way for home consumption. There is room for great improvement with practically all of these crops. Just where the trouble now lies is difficult to say. Little seems to be known in regard to the time and manner of planting. In the markets one finds quite a variety in the line of vegetables, but practically all are of very inferior quality. Tomatoes are very small and wrinkly, and in the States would be thrown away. Potatoes grown here are small, and must be imported

to the value of about $400,000 annually in order to supply home needs. Onions are also imported, as indeed are quite a variety of vegetables. Rice is the heaviest import, and amounts to considerably more than $1,000,000 annually. Many small patches of rice are grown in the interior of the island on the hillsides, but none is grown on the lowlands about the coast. There is considerable low, swampy land about the coast that might be devoted to the growing of lowland rice. The time of seeding and manner of cultivating would, of course, have to be determined by experimenting, but much knowledge could be obtained from Louisiana, where rice is grown on an extensive scale. Many of the methods used there would no doubt be applicable to Porto Rico.

Corn is grown to a considerable extent, and is used as food for both man and beast. The variety grown is a smooth flint, very similar to that grown in the New England States. It is shelled and ground, as a rule, by hand, although a few use hand shellers and grinding mills.

Wheat, barley, and oats are practically unknown, so that corn forms the chief grain that is fed to animals. Very few of the horses are fed any grain, and practically no grain is given to the cattle or work oxen.

FORESTRY.

It is said that Porto Rico was once covered with a beautiful virgin forest. Only a few remnants of such forest now remain to indicate what were the former conditions. It would seem advisable to protect and preserve these remnants, and in some instances to plant new forests.

AGRICULTURAL MACHINERY.

Very little agricultural machinery is used. In the cane fields plows, harrows, carts, hoes, spades, and machetes constitute nearly the complete list, while in the coffee district the hoe and machete are about the only implement used. In the latter case the steepness of the hills prohibits the use of much horse machinery, but in the cane fields modern plows, harrows, and cultivators can and should be used.

LIVE STOCK.

The live stock of Porto Rico consists mainly of cattle and horses, together with a small number of mules, asses, swine, sheep, and goats. Following is the total number of each class as ascertained by the census of 1899: Cattle, 260,125; horses, 58,664; mules, 6,985; asses, 1,085; swine, 66,180; goats, 15,991; sheep, 6,363; and fowls, 265,499.

Of the total number of cattle, 28 per cent are given as milch cows and 22 per cent as work oxen, the remainder being classed as calves, steers, bulls, young bulls, heifers, and yearlings. Of the various districts Bayamon leads in all classes of cattle except oxen, in which Ponce

excels. Ponce has more oxen, mules, and asses than any other district because of the demand for them as work animals on the large sugar estates.

The horses of Porto Rico are very small, and, as a rule, are poorly cared for and driven or ridden with very poor judgment. There are some exceptions, however, with regards the treatment of horses, and I have seen some very fine and spirited animals that were kept in the pink of condition. The feed of the horses consists almost entirely of cut grass, it being very exceptional to find them fed on grain. Such bulky food necessarily distends the bowels and unfits a horse for rapid traveling. Notwithstanding the fact, however, the native Porto Rican will harness his team to the carriage when their stomachs are full, and start at once on his journey at a full gallop. Under such circumstances the horses are winded at the end of the first kilometer, and before the second one is completed they are covered with sweat and lather, and wholly unfit to continue at anything but a slow gait unless given a rest. They are forced to continue, however, and complete the journey under continual lashing by the driver. When long journeys are to be taken frequent relays are made, usually at each 10 to 15 kilometers.

Although small the better horses are of good form, clean of limb, and apparently have a strain of good blood. With proper care as to feed and methods of driving these little horses are capable of rendering good service. As saddle-horses they are particularly good and easy-gaited and as hill climbers they are unexcelled and very sure-footed.

There is no marked mortality among the horses due to disease. The common diseases due to mistreatment, such as colic, lung fever, etc., are met with, but the worst, most revolting, and dangerous disease is glanders. Glanders is present in all parts of the island, and drastic measures should be taken at once to stamp it out. A skin disease, probably a form of mange, is not uncommon. Comparatively speaking, the insects that trouble the horses are few. Ticks are quite numerous, but there are practically no flies to bother.

The cattle of the island are better than one would expect to find. As work oxen they are excellent. Bullocks weighing 12 to 13 hundredweight, with powerful necks and good forms are not uncommon. Steers range on the luxuriant pastures of Guinea grass and "malojillo" grass and become fat enough for market without the addition of any other feed. Besides supplying the home demand for fresh beef the exportations of live cattle as beef and work cattle amount at present to more than half a million dollars annually. The chief market for the cattle is Cuba. In milking qualities the cattle fall far below their standard for beef and for work. The flow of milk is small and the quality poor as regards its fat content. It is quite the custom to milk the cows while the calf is sucking; otherwise it is thought they will

give but little and soon go dry. Milk sells in the towns and cities from 6 to 9 cents per quart. The more advanced dairyman delivers the milk in cans hauled on a spring cart, while others carry it to market in small cans on the backs of horses. Still others drive the cow about from door to door and milk directly into the customers' receptacles A form of cheese is made which resembles our cottage cheese, but is in reality more solid. Practically no butter is made, and indeed butter is but little used by the people of the island. Cattle enjoy much comfort in the island, suffer little from the heat, are quite free from the annoyance of noxious insects, and are seldom bothered by diseases. They range on luxuriant pastures and seldom want for abundance to eat and drink. Export cattle for beef sell for $2.25 per arroba (25 pounds). This is discounted 40 per cent for shrinkage in dressing, which makes the price about $5.40 per 100 pounds, corresponding very nearly with the prices in the United States. In recent years the price has been as high as $3 per arroba, which equals $7.20 per 100 pounds. The raising of live stock in Porto Rico may be considered a paying business as conducted for the past few years. The demand for some of the present pasture lands for the production of sugar will have a tendency to increase the cost of production.

The swine of the island are of a very inferior kind, being small and of the "razor-back," "rail-splitting" variety. They are commonly tethered out by a rope and get their living largely from grass and weeds, but are at times allowed to range in the tuber patches, where they can root up the yams, potatoes, etc., and they are also fed plantains and the small nuts that grow on the royal palms.

Goats are of the short-haired, milk-producing kind and are used for flesh and milk. They apparently do well.

Sheep are rather scarce and have comparatively little wool. It is probable that sheep for the production of wool would not do well in so warm and wet a climate.

Fowls, which consist chiefly of chickens, are small and active, the cocks being of the kind used for fighting. Eggs in the markets can seldom be purchased for less than 2 cents each, and chickens are as correspondingly high in price.

There is room for improvement all along the line of live stock, the demand being greatest in the case of the milch cows, horses, swine, and chickens. The essentials in such improvements will be the introduction of new blood, care in selection, and more rational methods in the feeding, care, and treatment of the animals.

INSECT PESTS.

Of the insect pests nothing is more pernicious than a mole cricket, known as "la changa." It is believed to have been introduced from Peru, and is very destructive to a wide range of plants in their early

growth or period of becoming established. It is especially troublesome in starting vegetables on sandy land. It works at night, burrowing beneath the surface of the ground and eating the young plants off just below the crown. In case of a lack of food it migrates during the night, even to a considerable distance, and continues its destructive work. On account of its nocturnal habits, its mode of flight, and working beneath the surface, it is a most formidable pest, and no doubt much patience, time, and ingenuity will be required to exterminate it. Methods of extermination by means of barriers of tar, by catching with traps, light, and by the use of fertilizers have already been inaugurated, but it is yet too early to know what ultimate success may be attained.

Scale insects, especially the purple scale and the chaff scale, are common on the orange, as are also several fungus diseases, among which may be mentioned verrucosis, melanose, and sphærostilbe. In the interest of the orange planters these need immediate attention, which will be given as soon as the entomologist can spare the time.

THE SCOPE AND PURPOSE OF THE IRRIGATION INVESTIGATIONS OF THE OFFICE OF EXPERIMENT STATIONS.

By Elwood Mead, *Irrigation Expert in Charge.*

With relation to rainfall the territory of the United States is divided into three parts—the humid, the subhumid, and the arid. In the humid region the rainfall is ordinarily abundant, but there are occasional seasons when it is insufficient for the raising of crops, and in most seasons there are times when crops are checked in their growth by periods of drought lasting from a few days to a few weeks. The subhumid region includes the territory where dry periods in summer are the rule. The injury to crops in subhumid regions is due to two causes—insufficient moisture and great irregularity in its distribution. The arid region includes the areas where cultivated crops can not be grown by the aid of rainfall alone.

Geographically, these regions are arranged from east to west, although no exact line can be drawn separating them. The humid region, as generally described, includes all of the United States westward to a line which would cross Nebraska and Kansas about halfway between their eastern and western borders. The subhumid region lies between the humid and arid regions, extending from the Gulf of Mexico to Canada and including irregular areas in the different Pacific coast States; while the arid region includes all the territory lying west of the eastern subhumid belt with a considerable exception along the Pacific coast, and with smaller local areas in each of the arid States.

Irrigation is employed as an aid to agriculture in all of these regions. It is a necessity in the arid region, of great value in the subhumid district, and is proving highly profitable in the growing of certain crops in the humid region. There are also large areas in the recently acquired insular possessions of the United States where irrigation is required, and where the value of the products permits of a large outlay to provide for its use. The work of the irrigation investigation of the Office of Experiment Stations covers therefore the whole of the United States.

INVESTIGATIONS IN THE ARID REGION.

The greater part of the irrigation work of this Office has been carried on in the region where farming is impossible without the artificial

application of water to crops. This includes all of the Territories of Arizona and New Mexico, the States of Colorado, Utah, Nevada, Montana, and Wyoming, and large parts of California, Oregon, Washington, Idaho, North Dakota, South Dakota, Nebraska, Kansas, and Texas. The greater attention paid to the problems of this section of the country is justified by the fact that here irrigation is a necessity rather than a valuable adjunct to agriculture. It measures agricultural settlement and very largely controls the development of other industries, because both the cost and comfort of living are very largely determined by the production of a home food supply. In the regions farther east, the adoption of irrigation is determined by whether or not it will improve conditions already favorable, but in the arid region it is the choice between civilization and desert condition.

The work in this region has followed two general lines—agricultural and engineering, legal and social. Of these, the legal and social problems present the greatest difficulties and stand most in need of an early solution. The success of irrigated agriculture in this region requires first of all the creation of institutions which shall offer a just and adequate foundation for future development. Such a foundation requires that the users' rights to streams must be clearly defined in order that those who now use streams and those who expect to use them may understand how much of the water supply is appropriated and how much remains open to appropriation. The litigation and controversy which now menace communities and which are a constant source of anxiety and loss to irrigators should be brought to an end. In order to effect these desirable reforms, a knowledge of certain essential facts is required. Among these are the quantity of water required to grow crops, the losses from seepage and evaporation in distribution, the character of the control over streams already vested, and the kind of administrative measures needed to insure effective division of streams among the multitude of users who depend thereon. Specific information along these lines is indispensable to wise and effective action in the future either by the Government or by individuals. It is the information which should have been gathered at the very outset of this development, but the long delay in its collection renders it all the more urgent that it be carried on now to an early and effective completion.

The work along agricultural and engineering lines has been largely carried out in cooperation with the agricultural experiment stations of the different States, and with the State engineers in States having such officials. By undertaking systematic work on some of the general problems of irrigation, this Office has been able to supplement and extend the work of the experiment stations, and at the same time has aided them to take hold of other studies, such as problems relating to the economical use of water on different crops. It makes possible the

IRRIGATION INVESTIGATIONS—MEASURING STATION ON JACKSON LATERAL, LAGUNA CANAL, ROCKYFORD, COLO.

bringing together of observations from the whole country. It promotes uniformity of methods in these investigations and thus gives to the results a wider value than is possible with each station working independently and alone. It brings together the experience of the whole irrigated West for the use of each locality, and shows the farmers of one section where their practices can be improved by adopting those of other and oftentimes far distant sections.

AGRICULTURAL AND ENGINEERING PROBLEMS.

The studies of the practical questions involved in diverting water from streams, transporting it through canals and ditches, distributing it over the land, and determining the requirements of different crops have been carried on in all of the arid and semiarid States with one exception. In general, the results of this work show that the losses in distribution are much greater than has usually been supposed, and that the quantity of water required, where these losses are included, is somewhat greater than has been estimated by many writers on the subject or stipulated in many water-right contracts. The stations for the measurement of the duty of water are scattered over nearly one-third of the United States. The averages of the different measurements for the past two years show a surprisingly close agreement when this wide range of conditions is considered, as appears from the following summary:

	Feet.
The average depth of water applied to crops in 1899 was	4.35
The average depth of water applied to crops in 1900 was	4.13

One of the results of this work has been to show the importance of keeping canals in good condition, and to emphasize the benefits resulting from diminishing as far as possible the losses by percolation. Measurements show that the loss from seepage and evaporation in ditches and canals varies from 15 to 70 per cent of all the water taken in at their heads, and that by far the greater part of this loss is due to seepage. Formerly many believed that most of the loss was due to evaporation, and was therefore beyond the power of man to remedy. Now that it has been demonstrated that the water disappears through the sides and bottoms of ditches and canals, steps can be taken to improve these channels and the loss stopped to a great extent. Improvements of this character will increase the area which can be irrigated, and save much land for productive agriculture which would otherwise become swamps and marshes.

The difference between the high and low duties obtained under practically the same conditions shows that where water can be had in abundance the natural tendency is to use too much, resulting in a reduction in the yield of crops, a temporary injury to the land, and a

limitation of the area which can be irrigated with the available water supply.

In many localities a lavish use of water has converted areas once arid into alkali marshes, of which the only product is cat-tail flags, and made drainage necessary at a cost fully as great as was required to provide the water supply in the first instance. The need of this drainage might have been avoided in many cases had canals been constructed with more care and the evil results of overirrigation appreciated at the outset,

The soils of the arid region are rich in mineral ingredients. This is due in part to their origin and in part to the scanty rainfall, which has not been sufficient to wash out the soluble elements, as has been the case in humid regions. Because of this there are large areas which are highly charged with alkali. The tendency of irrigation is to leach these salts out of the higher grounds and concentrate them in the lower lands. Evaporation tends to bring them to the surface, where they accumulate in such quantities as to kill vegetation. The remedy is to be found in drainage, and this investigation has been called upon to assist in solving the larger engineering and legal problems connected with the formation of drainage plans. As some of these districts embrace in the aggregate many thousands of acres, in which not only the alkali but the water plane has risen until it has reached the surface, it is necessary that the plans should be comprehensive, and must include provision for removing the surplus water as well as the salts which are to pass with it. Drainage studies must include the causes of their being flooded and a determination of the source and volume of the water to be removed. Drainage and irrigation are a part of one whole, and their investigation should be carried on together. The office is now engaged in this work in Colorado and California.

The publication and circulation of the facts being gathered regarding the injuries resulting from excessive losses in distribution or wasteful use will go far to prevent a recurrence of such injuries in other localities where irrigation is yet in its infancy. Another result will be the reclamation of more land than would otherwise be possible.

INSTRUMENTS FOR MEASURING WATER.

In carrying on the measurements of water it was found that the instruments used were in many cases not suited to the work required of them, and were so expensive as to limit their use generally to Government and State work. With the progress of the work of the investigation there has been a growing demand for instruments which will do accurate work and at the same time be within the reach of canal companies and individual irrigators. The instruments most used are the current meter and the register for keeping a continuous record

IRRIGATION INVESTIGATIONS—FLUME AND REGISTER USED IN MEASURING IRRIGATION WATER.

of depth of water at any point. Efforts have been made to cheapen these instruments and at the same time increase their efficiency. Little has been accomplished with the current meter, but the water register has been so simplified as to reduce its cost by more than half without any sacrifice in accuracy. The appearance and method of using these registers is shown in Pl. XXXIX.

LEGAL AND SOCIAL PROBLEMS.

The measurements made to determine the quantities of water used and the losses from canals has another object besides the improvement of agricultural practices. It is a principle of irrigation law, in theory at least, that rights to water are based on beneficial use; that is, a person or company can maintain a right to only so much water as he or it can put to a beneficial use in irrigation. It is of first importance, therefore, to know how much water is needed to grow crops on a given area, in order that courts and boards of control may intelligently determine the amount of rights to water, and officers charged with this duty be able to prevent wasteful use by those who have early rights or a desire to monopolize the supply. Because of the lack of this information, rights to water have too often been established without any regard to the volume of the stream, the capacity of canals, or the needs of the land to be irrigated. The attempt to utilize such excess rights can lead to nothing else than continued litigation and trouble. The facts gathered in these investigations are already being eagerly sought as a guide in the establishment of water titles, and they are certain to prove one of the most effective agencies in preventing erroneous or excess decrees in the future.

A knowledge of the extent of the losses from canals is also necessary to the proper distribution of the supply. Appropriations usually contemplate the measurement of the volume allowed at the head of the canal, hence the amount granted should be great enough to meet all the necessities of crops and also to allow for losses in transit. If this estimated loss is too large the volume taken in at the head gate will be greater than the needs of the land irrigated, but if too small irrigators will suffer. Excessive allowance for these losses puts a premium on poor construction, hence data is needed to show what are reasonable losses and to prevent anything above this. Where losses can be stopped appropriations should be cut down in order to compel ditch owners to make them economical water carriers. Losses which can not be stopped should be provided for.

IRRIGATION LAWS.

Along with the observations and experiments in the use of water has gone a study of the laws and customs which control its distribution. This study reveals the fact that the development of irrigation

law has not kept pace with irrigation engineering or agricultural practices. As the need and value of water has increased, engineers and farmers have found ways to conserve the supply and economize in its use. But it is too often the case that this increase in value has only added to the uncertainty as to titles, since it presents greater inducements or temptations to those holding inferior rights to try to secure a larger share of the supply. The absence of tribunals for the final establishment of water titles, and the lack of public control over the division of streams, puts upon the holders of the older and better rights the burden of protecting their interests either by force or in the courts. The greatest need of irrigation is legislation which will end this uncertainty and controversy, but from the nature of things such legislation is hard to secure. Conservative legislative bodies are slow to act, and they often have not the information on which to base intelligent action, even if they have the desire to do all that should be done. The conflicting views of appropriators of water make it impossible to enact any effective law which will not be strongly opposed, or which will not work hardship to some individual. The work of this Office is limited to collecting and publishing information, with discussions by experts whose broad views enable them to better interpret the facts than is possible where details and local interests obscure the general policies which should prevail.

Studies of irrigation laws and customs have been made in connection with the measurements of water in all the arid States and Territories. Comprehensive studies of irrigation laws and customs have been made in California and Utah. A report dealing with the agricultural situation in California has just been published. This study was undertaken in response to a petition from the citizens of that State in the hope that a clear statement of existing conditions would help toward the enactment of a comprehensive code of irrigation laws.

A similar study has been made in Utah, and the reports of the different observers are about ready for publication. These reports will show that titles to water in that State are far from being stable or secure, and that there is urgent need of a cheaper and simpler method by which they can be permanently settled.

The conditions found in California and Utah are not peculiar to those States. They are common to nearly all the arid States. Their betterment is the first step in the successful or the complete use of Western water supplies. As has been said, the work of this Office can not extend to the enactment of laws. It must stop with showing existing conditions and pointing out remedies for the evils found. With this end in view the laws of not only our own States, but of Canada, Australia, Europe, and Egypt, are being studied in order that the best lessons from the experience of all the world may be within the reach of those who must enact the laws which will protect and

encourage investment in irrigation enterprises. An agent of the Department is now in Egypt studying the legal systems in vogue there.

ORGANIZATION OF IRRIGATION INDUSTRIES.

Not less important than the system of irrigation laws is the character of the organizations which control the water supply under these laws. Irrigation is essentially a cooperative industry. In its beginning small ditches were sometimes constructed by individual farmers, but opportunities for such construction are practically all utilized. The large canal covering the lands of many farmers is in most remaining cases the only possible one; hence the existence of the industry calls for organization and cooperation, and in most cases not only cooperation of farmers but of capitalists as well. The problem to be solved here is how to secure returns upon the capital invested and at the same time keep the land and water within the reach of the poor man, the only man who is seeking for a new home. This problem has not been solved in this country. It is one which must be solved before irrigation can go much further.

Under the laws of many States water rights are granted to the canal companies. In those States the rights of the farmers depend on the form of the organization of these companies rather than on the laws. The reports of this Office show that the peace and prosperity of many communities, as well as the economy with which water is used, depend almost wholly on the rights of the individuals under the companies. This study of organization and its effect on development is being carried on wherever the measurements of water have been made.

In this connection it seems proper to reiterate the views expressed in a former report on the subject of water rights. The first step in future development should be to reach an enlightened agreement regarding the true character of these rights. The idea of private ownership in water apart from land can not prevail without creating institutions essentially feudal in character. To give to companies or individuals the control of streams, and make the farmers who use those streams dependent for their rights on the conditions which these companies impose in private contracts, is to make the water company the practical owner of the land it serves and the irrigator and farmer a tenant. A proposition which would contemplate turning over all the land of the West to private monopolies and making those who have homes upon it dependent upon these monopolies would not command popular support, but the idea of private ownership in water, amounting to a virtual monopoly of this vital element, has been permitted to grow up in some sections of the West. To a certain extent it has obtained recognition in legislation and protection in judicial decrees and decisions. Such a doctrine meets with no favor in other irrigated

lands, and should in this country give place to the more just conception that rights to water should be restricted to the right of use, and that ownership should not be vested in either companies or individuals, but in the land itself. When this principle is adopted the control of water is divided like the control of land among a multitude of proprietors; water monopoly is impossible, and no other abuse or injustice is encouraged. Years of experience in other lands and the limited experience of this country have abundantly proven that peaceful and orderly development can not be realized except as water and land are united in one ownership, and canals treated as public or semipublic utilities rather than as a means of fastening a vicious monopoly upon communities.

IRRIGATION IN THE SUBHUMID PORTIONS OF THE UNITED STATES.

The subhumid portions of the United States possess certain advantages in the employment of irrigation which must in time greatly extend its application in this section of the country. There is a greater rainfall and a more humid atmosphere than in the arid region, so that a given water supply and a canal of given dimensions will irrigate more acres than in the region wholly arid. Much of the subhumid district east of the Rocky Mountains is remarkably well suited to the distribution of water in irrigation. The slope of the country away from the mountains is about what is needed for the construction of canals and the distribution of water over the ground. The practical obstacles to be encountered, either of an engineering or agricultural character, are less, as a rule, than in either the arid or humid sections, and the cost of supplying water is proportionately reduced. Important studies have been made during the past year in this region by Prof. O. V. P. Stout, of the Agricultural Experiment Station of the University of Nebraska, acting under the direction of this Office. This station is in a section where lands have been cultivated for many years, and where agriculture is a demonstrated success without the aid of irrigation. The question to be settled is whether the use of water on general farm crops will give sufficiently increased yields to repay with a profit the cost of providing the water supply and distributing it over the land. Results thus far secured show that it will. The maximum yield of corn in this locality without irrigation is about *40 bushels per acre*, while the lands irrigated during the past year yielded *from 40 to 60 bushels per acre*, with a maximum yield in rare instances of *90 bushels per acre*. Two adjacent fields, one irrigated and one depending on rainfall alone, *yielded 66 bushels and 20 bushels per acre*, respectively.

The methods of diverting and applying water were those of the ordinary irrigator; the soil and climate were typical of the terri-

IRRIGATION INVESTIGATIONS—RESULTS OF IRRIGATION IN WISCONSIN.

The two central piles show the yield and size of potatoes grown on unirrigated rows. The two end piles show the yield and size of potatoes grown on irrigated rows.

tory which extends westward from the Missouri River for 250 miles, and the results can fairly be taken as representing what may be expected in seasons of scanty rainfall throughout the greater part of the subhumid district.

IRRIGATION IN THE HUMID PORTIONS OF THE UNITED STATES.

The experience thus far gained makes it certain that irrigation is destined to be an important means of improving the already prosperous conditions of agriculture in humid and subhumid portions of the United States. The possibilities along this line have not yet been fully established, but the lessons thus far learned seem to be that it has a wide field of usefulness wherever intensive agriculture is practiced or where insurance from drought is important. The irrigation investigations of this Office now include a study of the problems of irrigation in this region—in Wisconsin and Missouri, to determine what can be done in the States of the Middle West; in New Jersey, to ascertain its field of usefulness in the North Atlantic States; in the Carolinas and Georgia, to determine its possibilities in the South Atlantic region; and in Louisana and Texas, in connection with the increasing use of irrigation in the production of rice.

IRRIGATION IN THE MIDDLE WEST.

During the past season studies of the benefits of irrigation in Wisconsin have been carried on under the immediate direction of Prof. F. H. King, of the College of Agriculture of the University of Wisconsin, at the station farm at Madison and at Stevens Point. In both cases the water supply had to be provided by pumping, and records have been kept to show the amount of water used, the time of its application, the cost of pumping, and the increase in yield of the various crops to which it was applied. Owing to the exceptional drought which prevailed, the results were highly favorable to irrigation. The difference in the yield and size between the irrigated and unirrigated potatoes is shown graphically in the illustration (Pl. XL), in which the larger piles of larger potatoes represent the product of the irrigated rows and the smaller piles of smaller potatoes the unirrigated rows. If the results of one season's trial would justify drawing definite conclusions, it would be that irrigation in Wisconsin is a marked success; but that is not the case, and it is the intention to continue these studies for a number of years, the work being broadened so as to include all the crops which promise beneficial results.

A cooperative investigation in irrigation is also being carried on between the Missouri Experiment Station and this Office at Columbia, Mo., under the direction of Prof. H. J. Waters. Apples, strawberries, and nursery stock were the crops receiving the most attention, arrange-

ments for the water supply not having been completed in time to prepare for its application to other staple farm crops. The beneficial effects of the irrigation of strawberries are shown in the illustration of the irrigated and unirrigated rows (Pl. XLI, figs. 1 and 2). Careful records were kept of the quantity of water used, the cost of furnishing it, and the time of its application. The report of Professor Waters states that "the season was very disastrous to strawberry plants, many of the old plants dying, and practically no runners being formed under ordinary treatment. The irrigated plants developed strong crowns, and undoubtedly stored an abundant supply of food for next year's crop. The strawberry nurseryman, the man whose business it is to supply plants for the commercial strawberry grower, will find in irrigation absolute protection against failure." It will require next year's record of the yield to determine the full measure of the benefits of this year's irrigation. Referring to the result of this year's watering of nursery stock, Professor Waters believes that nurserymen will find irrigation exceedingly profitable, that it will result in securing larger growth in young trees, trees with better formed heads, and possibly a saving of one year in the time when nursery stock can be placed on the market. He also believes that the protection of bearing trees from injury by drought is a matter of very great importance, because this injury often extends beyond the season when the scarcity of water begins.

IRRIGATION IN THE NORTH ATLANTIC STATES.

In the North Atlantic States the large area devoted to market gardens makes security against drought a matter of much importance. Throughout this region the average rainfall provides sufficient moisture if properly distributed, but short droughts just at the time when the crops are maturing frequently cause heavy losses. In many years no such droughts occur, but they come often enough to make the growing of vegetables and small fruits uncertain. The problem to be solved is whether the saving of an occasional crop and the increased yield of many crops will repay with a profit the cost of providing a water supply. The study of these questions is being carried on by this Office in connection with the agricultural experiment station in New Jersey, Prof. E. B. Voorhees, director of this station, being in charge. His experiments, so far reported, have been limited to small fruits. They show that, in case of almost all varieties, the increase in the product of the irrigated tracts over the unirrigated ones was considerably more than enough to pay in a single season the entire cost of providing the water supply as well as the expense of applying it.

In addition to making experiments with small fruits, Professor

FIG. 1.—IRRIGATION INVESTIGATIONS—RESULTS OF IRRIGATION IN MISSOURI.
Showing growth of strawberry plants on the unirrigated plat at the close of the season.

FIG. 2.—IRRIGATION INVESTIGATIONS—RESULTS OF IRRIGATION IN MISSOURI.
Showing growth of strawberry plants on the irrigated plat, with formation of new plants.

Voorhees collected data from private parties in regard to the irrigation of various kinds of garden truck. In most cases the results were equal to those obtained in the experiments made under his personal direction, paying the entire cost of installing the pumping plants, with a profit, in a single season.

An analysis of the rainfall records at Philadelphia, covering a period of seventy years, shows that in considerably more than half the years there was a lack of rainfall in some one month of the growing season to seriously affect the yield of small fruits and garden vegetables, which constitute so large a part of the products of the Eastern farms. Taking Philadelphia records as typical of the eastern United States, and the results so far obtained in New Jersey as a basis for deduction, it will be seen that an irrigation plant would be a profitable investment for most of the farmers living where our large cities provide a ready market for small fruits and vegetables.

It is not likely that the water-right problems which are so large a factor in Western development will prove of equal importance in the East, owing to the larger flow of streams and the fact that the areas to be irrigated will always be restricted, but in many localities there are already indications that important legal problems will have to be solved before irrigation can safely assume the importance which its value will naturally give it. The work of this investigation along the legal and social lines can well be extended to this section. The experience of the West will in time come to be of value in solving the water problems of the East.

Among the important work which needs to be done in the East along agricultural and engineering lines is a study of the cost of installing and operating pumping plants for small areas. Something has already been done along this line and arrangements are being made to continue this more effectively in the future.

RICE IRRIGATION.

During the past season the problems of rice irrigation have received much attention from this Office. The investigations inaugurated have been principally along agricultural and engineering lines. In the Carolinas it has included a study of the methods of storing water to provide a supplemental water supply; the methods of diverting and distributing it over the fields and the problems connected with the regulation of tidal rivers so as to determine what may be done, either by the Government or by the concerted action of private individuals; and the construction and maintenance of levees for the protection of fields against floods or injury from breaks above or below.

Rice growing in the Carolinas and Georgia is not as important an industry as it was fifty years ago. In part, this decline is due to the

cost of labor. The rice fields are located along the low alluvial bottom lands where the greater part of work must be done by hand. This leaves only a small margin of profit at present prices, and the danger of this being occasionally lost through breaks in levees or river floods has tended to retard a revival of what was once an important and valuable industry.

There seem to be two or three questions which this investigation can properly deal with. One is to what extent State or Government aid is required to assist in the regulation of streams, and to study the topography and watersheds of streams to ascertain what measures may be taken to furnish a supplemental water supply through storage.

The growing of rice on the uplands in Louisiana and Texas presents an entirely different condition of affairs. Here the industry has been from the first unusually successful, and it has increased until it has assumed a national importance, promising to make the United States an exporter instead of an importer of this staple product.

Aside from the agricultural questions peculiar to rice farming, the irrigation of these uplands presents new problems in canal construction and the lifting of water. In the arid region streams as a rule have a heavy fall, and it is therefore easy to get water onto the lands to be irrigated by gravity. In the rice districts the water supply is below the lands to be served, in streams which have hardly enough fall to produce a perceptible current, and the water must therefore be raised by pumps. Even with this expense, rice growing has proven remarkably profitable. The rice lands, which were formerly worth from $1 to $3 per acre, and used only for grazing, now sell for from $30 to $50 per acre, and yield an annual return equal to the value of the land. About 250,000 acres of these lands have already been devoted to rice culture, and much more is capable of the same use.

Along a few of the streams used more land has already been devoted to rice than the streams can properly water, and the question of protecting the early users against the demands of those coming later is pressing for settlement. Louisiana has no laws or customs affording this protection. The publications of this Office place at the command of the canal owners and lawmakers of that State the results of the experience of other States and countries, and will afford them the means of enacting a just and intelligent law governing water rights whenever such action becomes necessary.

A report will soon be published showing the methods used in irrigating rice and discussing the problems which have arisen in the rice districts. This investigation should be continued by the experts employed by this Office, whose familiarity with conditions elsewhere makes them especially fitted for the solution of the problems arising in this new field.

IRRIGATION IN THE INSULAR POSSESSIONS OF THE UNITED STATES.

HAWAIIAN ISLANDS.

During the past summer officials of the Hawaiian Islands requested this Office to make such investigation of the irrigation problems of these islands as would furnish the facts needed in framing an effective code of irrigation laws. The need of such legislation is becoming urgent. Large investments in irrigation works to supply water for the growing of cane have made the subject of water ownership and control one of the most important internal questions of these islands. Proposals have been made by private parties to purchase from the government all of the water rights attached to public lands. Wise action on such proposals will be promoted by a thorough investigation of agricultural conditions and the prospective needs of irrigators. An agent is now engaged in collecting facts as to the use of water on these islands.

PORTO RICO.

Large areas in Porto Rico to be productive require irrigation. Legislation will therefore be needed for the establishment of water titles and to protect the holders of these titles in times of scarcity. It is now admitted everywhere that if water laws and land laws had been framed and administered together in the settlement of the arid West many of the complications which now exist could have been averted. The opportunity is now open for inaugurating a comprehensive code of laws in Porto Rico which shall control development from the outset, and it is believed that an investigation to determine the facts on which such laws should be based should be inaugurated at once.

THE NEED OF EARLY AND EFFECTIVE REFORM OF IRRIGATION LAWS.

While the area of land in the West susceptible of reclamation is small when compared to the whole extent of the arid region, it is practically unlimited when reference is had to the water supply. Along almost every stream there is an abundance of irrigable land and a shortage of water. This brings attention to the importance of measurements and experiments to determine how much water is necessary to successful agriculture, and to inaugurate such measures in its distribution and use as will secure the utmost economy. The area ultimately to be reclaimed will depend wholly on the water supply, and any excessive or wasteful use on land already under cultivation deprives other land equally good of that which would give it value, prevents

the increase in homes, and robs the State and community of taxable wealth. The laws of most Western States have recognized this and prohibited the wasteful use of water, but without greater knowledge they can establish no standard by which to determine what is a wasteful use.

The fact that the water supply is the source of all agricultural values also emphasizes the need of an efficient system of public control. Some States have realized this need and have provided for it. Colorado has 75 officials appointed by the governor, whose sole duty is to see that the water supply is properly distributed. Wyoming has a like system, with 48 officials engaged in guarding its water supply. Nebraska also has a similar system. Utah and Idaho have also made partial provision for accomplishing this result. In the other States, where protection is afforded for every other kind of property, water is left to be fought over in the field and in the courts, and even when controversies are settled in this way for one year, the next season of drought is almost certain to bring a renewal of the conflict. In the localities where those using water from a stream can settle their rights satisfactorily to all concerned, there is nothing to prevent newcomers from building other canals, establishing new rights, unsettling existing conditions, and in this way prolonging the anxiety, uncertainty, and controversy indefinitely.

There are other reasons for a prompt and comprehensive study of water-right problems. In every arid State and Territory the acreage of land under ditches already built is largely in excess of the land now being cultivated. In Idaho there are about 1,600,000 acres of land under existing ditches, of which only 600,000 are now being irrigated. In Wyoming there are probably 2 acres under ditches for every acre that is cultivated. Along the Arkansas River in Colorado and in western Kansas, the same conditions prevail. The same is true of the ditches in New Mexico. In the Salt River Valley, in Arizona, the canal systems cover an area of 350,000 acres, of which less than 150,000 are being cultivated. In northern California many completed ditches are only partly used and a few not used at all. The rights to water in most of these States are based upon the estimated capacities of the ditches, and when the lands for which these rights have been acquired are actually brought under cultivation the present difficulties experienced in the distribution of the supply will be greatly enhanced. This makes necessary two things; (1) more effective administrative provisions, and (2) a knowledge of the facts which ought to govern these officials in the performance of their duties. In some of these States the lack of cultivation of the lands under ditches is due to an inadequate water supply. The streams on which they depend have an abundance in the early part of the season, but this is followed by a drought in July and August. Here the remedy will be found in

storage. In other cases, development has simply outrun settlement and only time and effective measures for colonization are required. In others, inadequate water laws and uncertainty regarding water titles is the cause of the delay in making use of the facilities already provided. Farmers do not feel warranted in building laterals, planting crops, and making contracts for water when the most probable result of this outlay will be an injunction suit. The story told on pages 171–183, Bulletin 100 of this Office, shows that this danger is not imaginary.

The investigations of this Office have shown that the boundaries of irrigation districts should follow drainage lines, that rights to water should include all the watershed of the stream, and that administrative control should not be restricted as it is now in some States by arbitrary county boundaries. In several States county commissioners are made water commissioners; but as many streams flow through more than one county, in some cases through six or seven counties, there can be no adequate or proper supervision. Colorado, Wyoming, and Nebraska have each been divided under State laws into irrigation districts based on drainage lines rather than on county lines. This makes possible an effective division of water within the boundaries of these States. Something to supplement State supervision, however, will in time be required. There are interstate questions which can not be ignored, although laws to provide for the proper division of water within a State are a more vital and urgent necessity than measures to settle the division of interstate streams. The study of interstate rights should, however, begin at once. It will be most unfortunate for all concerned to delay this study until the gravity of the issues created shall result in hasty or ill-considered legislation. What is needed is a careful and impartial investigation of this question by competent engineering and agricultural experts. The problems to be solved are primarily agricultural and engineering. The first questions to be determined are: Where is water now being used? Where can it be used to the best advantage? What are the character and extent of vested rights? These matters ought to be settled by the dispassionate, unbiased study of experienced men and not left to be fought over in the courts by warring private interests. It is impossible for Congress to legislate regarding water rights within States without revolutionizing existing conditions in some of the States, and without interfering with vested rights. The differences between State laws and in the character of the rights established under those laws make such a result inevitable. But a commission could determine what proportion of a stream should flow down from the State above to the State below, and leave it to the authorities of the State above to determine what measures shall be taken to accomplish this result, and to the authorities of the State below to determine what shall be done with the

water when they receive it. In this way there would be no interference with vested rights or with State codes of laws, while at the same time, there would be a far better prospect of securing a just and effective division of the supply than through interstate litigation such as is now impending.

LIST OF PUBLICATIONS OF THE OFFICE OF EXPERIMENT STATIONS ON IRRIGATION.

POPULAR PUBLICATIONS FOR GRATUITOUS DISTRIBUTION.

(Requests for these publications should be sent to the Secretary of Agriculture or to a Senator or Representative in Congress.)

Farmers' Bulletin No. 46.—Irrigation in Humid Climates. By F. H. King, Professor of Agricultural Physics, College of Agriculture, University of Wisconsin, and Physicist of the Wisconsin Agricultural Experiment Station. Pp. 27, figs. 4.

Treats of the advantages of an abundant supply of soil moisture, the rainfall of the growing season in the United States, water as a plant food, the advantages and disadvantages of irrigation in humid climates, extent of irrigation in the humid parts of Europe, the rainfall of Europe and the Eastern United States, the character and antiquity of European irrigation, fertilizing value of irrigation waters, lines along which irrigation should first develop, land best suited to irrigation in humid climates, waters best suited to irrigation, amount of water needed for irrigation, methods of obtaining water for irrigation, the construction of reservoirs, and methods of applying water.

Farmers' Bulletin No. 116.—Irrigation in Fruit Growing. By E. J. Wickson, M. A., Professor of Agricultural Practice, University of California, and Horticulturist of the California Experiment Station. Pp. 48, figs. 8.

A statement of the relations of irrigation to fruit production, and of irrigation methods, as they have been demonstrated by Pacific coast experience.

Farmers' Bulletin No. 138.—Irrigation in Field and Garden. By E. J. Wickson, M. A. Pp. 40, figs. 18.

This bulletin discusses the irrigation of the field and garden from the standpoint of the individual farmer, and contains instructions on the determination of ditch levels, the measurement of small streams, sources of water supply and their use, including the diversion of water from streams, the development of water in dry creek beds, the development of springs, the collection of water from the sides of canyons and ravines, tunneling for water, flowing wells, pumping for irrigation, and the storage of storm water; the distribution of irrigation water, including the location of the farm ditch and the turning of water from ditches; methods of applying water, including flooding, the depressed bed, ditch-bank irrigation, furrow irrigation, raised-bed irrigation, subirrigation, and underflow, and irrigation by sprinkling; the choice of an irrigation method; and the time for the application of water.

Rise and Future of Irrigation in the United States.—By Elwood Mead, Expert in Charge of Irrigation Investigations, Office of Experiment Stations. Pp. iii, 591–612, pls. 5. (Reprint from Yearbook, 1899.)

A popular discussion of this subject under the following heads: Remains of ancient irrigation works; early irrigation in California; beginnings of modern irrigation; cooperative colonies in Colorado and California; corporate canal building and objections to such canals; water-right problems of the arid region; the appearance and resources of the arid region; present and future of irrigation, including growth of irrigation and need of better laws, need of reform in the management of public arid land, influence of the range industries, uncertainty as to State and Federal jurisdiction, complications from lack of uniform water laws, methods and measures needed to develop the arid region, appropriation and distribution of the water supply, public supervision and control of irrigation, and influence of irrigation upon people and country; and the commercial importance of irrigation.

Practical Irrigation.—By C. T. Johnston and J. D. Stannard, Assistants in Irrigation Investigations, Office of Experiment Stations. Pp. 491–512, figs. 8. (Reprint from Yearbook, 1900.)

Gives simple directions for the use of the individual farmer.

TECHNICAL PUBLICATIONS—FOR SALE.

(To secure these publications, address the Superintendent of Documents, Union Building, Washington, D. C., inclosing price given. Remittances must be made by cash or United States postal order. Postage stamps and checks not accepted.)

Bulletin No. 36.—Notes on Irrigation in Connecticut and New Jersey. By C. S. Phelps, B. S., and Edward B. Voorhees, M. A. Pp. 64, figs. 7. Price 5 cents.

This bulletin discusses the need, methods, and history of irrigation in Connecticut, irrigation plants in use in Connecticut, experiments on the effects of irrigation on strawberries, and suggestions regarding irrigation; the need of irrigation in New Jersey, amount of water necessary, storage of water, seepage, cost of irrigation, areas capable of being watered by gravity, irrigation by pumping, irrigation by wells, warping, water meadows, total area irrigable, estimated cost of irrigation and suggestions for small plants, use of irrigation in New Jersey, possibility of pumping large quantities of water from wells for irrigating purposes, and irrigation experiments in New Jersey.

Bulletin No. 58.—Water Rights on the Missouri River and its Tributaries. By Elwood Mead, State Engineer of Wyoming. With papers on the Water Laws of Colorado, by John E. Field, State Engineer; and of Nebraska, by J. M. Wilson, State Engineer. Pp. 80, maps 3, figs. 4. Price 10 cents.

A discussion of the irrigation laws which control the diversion and use of water from the Missouri River and its tributaries. The region covered in this discussion includes Colorado, Kansas, Montana, Nebraska, North Dakota, South Dakota, Wyoming, and the Northwest Territories of Canada.

Bulletin No. 60.—Abstract of Laws for Acquiring Titles to Water from the Missouri River and its Tributaries, with the Legal Forms in Use. Compiled by Elwood Mead, State Engineer of Wyoming. Pp. 77. Price 10 cents.

Includes abstracts of laws and legal forms in use in Colorado, Kansas, Montana, Nebraska, South Dakota, Wyoming, and the Northwest Territories of Canada.

Bulletin No. 70.—Water-Right Problems of Bear River. By Clarence T. Johnston and Joseph A. Breckons. Pp. 40, pls. 9. Price 15 cents.

Presents some of the water-right complications of interstate streams as illustrated on Bear River. The bulletin discusses the water supply of the river and its diversion and the controversies which have arisen regarding water rights and the need of uniform laws.

Bulletin No. 73.—Irrigation in the Rocky Mountain States. By J. C. Ulrich. Pp. 64, pls. 10. Price 10 cents.

Explains the agricultural conditions prevailing and the methods of acquiring and using water for irrigation practiced in that portion of the arid region covered more particularly by the States of Colorado, Wyoming, Utah, Idaho, and Montana, in which the conditions and methods are somewhat similar.

Bulletin No. 81.—The Use of Water in Irrigation in Wyoming and its Relation to the Ownership and Distribution of the Natural Supply. By B. C. Buffum, M. S., Professor of Agriculture and Horticulture, University of Wyoming, and Vice-Director of Wyoming Agricultural Experiment Station. Pp. 56, pls. 8. Price 10 cents.

This bulletin reports experiments on the duty of water for different crops in Wyoming, and discusses the application and measurement of water conditions affecting the duty and continuous flow as a basis of appropriation.

Bulletin No. 86.—The Use of Water in Irrigation. Report of Investigations made in 1899, under the supervision of Elwood Mead, Expert in Charge, and C. T. Johnston, Assistant. Including Reports by Special Agents and Observers W. M. Reed, W. H. Code, W. Irving, O. V. P. Stout, Thomas Berry, S. Fortier, R. C. Gemmell, G. L. Swendsen, and D. W. Ross. Pp. 253, pls. 50, figs. 18. Price 30 cents.

This bulletin explains the methods in use in the arid States in the distribution and use of water in irrigation. It gives a large number of measurements made to determine the duty of water and the losses by seepage and evaporation from canals, and discusses the methods by which the water supply may be more effectively and economically utilized in the production of crops.

Bulletin No. 87.—Irrigation in New Jersey. By Edward B. Voorhees, M. A., Director New Jersey Agricultural Experiment Stations and Professor of Agriculture, Rutgers College. Pp. 40, figs. 5. Price 5 cents.

Results of experiments conducted for the purpose of determining whether irrigation during short periods of drought in regions where the rainfall is usually sufficient

for the maximum growth of crops will sufficiently increase the yield to pay for the works necessary to obtain the supply of water.

Bulletin No. 90.—Irrigation in Hawaii. By Walter Maxwell, Ph. D., Director and Chief Chemist, Hawaiian Experiment Station. Pp. 48, pls. 6, figs. 3. Price 10 cents.

Discusses the climatic, soil, and other conditions as affecting irrigation in Hawaii, and gives the results of irrigation experiments, especially with sugar cane, carried on by the author for a number of years.

Bulletin No. 92.—The Reservoir System of the Cache la Poudre Valley. By E. S. Nettleton. Pp. 48, pls. 14. Price 15 cents.

A description of the reservoir system of the Cache la Poudre Valley, showing the benefits to be derived from the construction of reservoirs for the storage of water for irrigation.

Bulletin No. 96.—Irrigation Laws of the Northwest Territories of Canada and Wyoming, with Discussions by J. S. Dennis, Deputy Commissioner of Public Works, Canada, and Fred Bond, State Engineer of Wyoming, and J. M. Wilson, Agent and Expert, Irrigation Investigations, Office of Experiment Stations. Pp. 90, frontispiece, pls. 5. Price 10 cents.

Texts of the irrigation laws of the Northwest Territories of Canada and Wyoming, with the regulations, forms, and methods of procedure adopted in the administration of these laws, and a discussion of the principles underlying the laws and the methods followed in their enforcement.

Bulletin No. 100.—Report of Irrigation Investigations in California under the direction of Elwood Mead, assisted by William E. Smythe, Marsden Manson, J. M. Wilson, Charles D. Marx, Frank Soulé, C. E. Grunsky, Edward M. Boggs, and James D. Schuyler. Pp. 411, pls. 29, figs. 16. Price cloth $1.25, paper 90 cents.

This report deals with investigations carried on during the summer of 1900 in cooperation with the California Water and Forest Association. In addition to a review of the agricultural situation in the State, it presents a compehensive discussion of the water laws and customs under which irrigation is practiced in California as typified by the conditions in Honey Lake Basin, and on Yuba River, Cache Creek, Salinas River, San Joaquin River, Kings River, Los Angeles River, Sweetwater River, and San Jacinto River. It describes the methods and means by which water is diverted from these streams and used in irrigation, and the indefinite and excessive appropriations of water and the resulting litigation, and discusses the evils resulting from absence of State control of streams.

Bulletin No. 104. Report of Irrigation Investigations for 1900 under the supervision of Elwood Mead, Expert in Charge of Irrigation Investigations, including reports by special agents and observers W. M. Reed, W. H. Code, A. J. McClatchie, W. Irving, J. M. Wilson, R. C. Gemmell, G. L. Swendsen, O. V. P. Stout, W. H. Fairfield, D. W. Ross, O. L. Waller, S. Fortier, and J. C. Nagle. Pp. 334, pls. 25, figs. 29. Price 50 cents.

This report describes the study of the agricultural and engineering problems of irrigation made in the arid States and Territories during 1900. Among the subjects

dealt with are the amount of water used in irrigation, the losses from canals by seepage and evaporation, and the causes and effects of these losses. Data are presented showing the cost and value of pumping for irrigation, and the value of water per acre-foot as measured in the crops grown. Efforts to improve the methods of measuring and recording the volume of water used are described, and some of the instruments designed for this purpose are illustrated. Studies to determine the amount and effect of silt on the operation of canals and the permanence of reservoirs are described, and the relation of all facts gathered to the problems of future development pointed out.

Bulletin No. 105. Irrigation in the United States. Testimony of Elwood Mead, Irrigation Expert in Charge, before the United States Industrial Commission, June 11 and 12, 1901. Pp. 47, pls. 12, fig. 1. Price 15 cents.

The testimony contained in this bulletin presents a review of the irrigation situation in the United States, including not only the arid region of the West, but also the humid sections of the South and East, and also deals briefly with the practical aspects of extending public aid to irrigation either through the State or National Governments. The heads under which the review is given are as follows: Beginnings of irrigation in the United States; Importance of irrigation in the United States; Irrigation in the United States the result of private enterprise; Evolution of water laws in the arid region; Establishment of titles to water; Meaning of term "water right," and water-right contracts; Building of canals and distribution of water; Losses of water by seepage; Filling of canals by silt; Controversies over titles to water; Principles governing water rights in Canada and Wyoming; Storage of water for irrigation; Irrigation a State question; Leasing of the public grazing lands; National aid extended by land grants; Cost and value of irrigation; Products of the arid region; National aid for irrigation; Interstate water-right complications; Irrigation in the humid sections, and Filling of reservoirs by silt.

SCOPE AND RESULTS OF THE NUTRITION INVESTIGATIONS OF THE OFFICE OF EXPERIMENT STATIONS.

HISTORICAL INTRODUCTION.

Not the least potent of the factors that influence the welfare of a country is the rational and satisfactory nutrition of its people. Consonant with the increasing growth and prosperity of the United States and the development of education and of scientific research within its territory is the fact that our Government is now promoting a systematic and comprehensive inquiry into the nutrition of man, and especially the food and nutrition of its own people. This inquiry is authorized by Congress, aided by appropriations from the Federal Treasury placed in charge of the Secretary of Agriculture, and carried out in different parts of the United States. One most important feature is the cooperation with universities, colleges, experiment stations, and philanthropic organizations, literally from Maine to California and from Minnesota to Alabama. Another advantage is found in the fact that while the institutions and investigators have that liberty of initiative and action which is so essential for scientific research, the several inquiries are so coordinated and the investigators are so aided by counsel and by the collating of the results of inquiry elsewhere as to make both the individual investigators and the product as a whole far more useful than would otherwise be possible. Part of the fund provided by Congress is expended under the sole and immediate care of the Department; part is distributed in various places and used, not as compensation for services so much as an encouragement to research. The cooperating investigators and institutions are contributors to the enterprise, and the spirit of cooperation thus becomes in itself an important agency for elevating the quality and increasing the quantity of the work, diffusing the results, and insuring their most useful application. It thus comes about that an appropriation of public money, comparatively insignificant in amount, has assumed a noteworthy significance in its scientific, educational, sociological, and economic results.

The sums voted by Congress for this especial item of nutrition

investigations in the general appropriations for the Department of Agriculture have been:

For the fiscal year 1894–95	$10,000
For the fiscal year 1895–96	15,000
For the fiscal year 1896–97	15,000
For the fiscal year 1897–98	15,000
For the fiscal year 1898–99	15,000
For the fiscal year 1899–1900	15,000
For the fiscal year 1900–1901	17,500
For the fiscal year 1901–2	20,000

The contributions from other sources are not easily estimated in terms of money, since they consist in large part of use of laboratories, apparatus, and other facilities for research, and the counsel and help of experts and other gratuitous service. The State of Connecticut makes a small annual appropriation for nutrition investigations to the Storrs Experiment Station, which cooperates with the Department. A considerable number of experiment stations, educational institutions, philanthropic organizations, and private individuals have given sums of money to promote the cooperative inquiry.

It would be entirely wrong to attribute the whole of the results described beyond to this especial inquiry. Indeed, it represents simply a special movement begun after others had been long in operation, and is now running parallel with them.

NUTRITION INVESTIGATIONS IN THE UNITED STATES.

Until within a very few years, the most definite knowledge regarding the nutritive values of food and the laws of nutrition has come from Europe, but lately such information has been accumulating quite rapidly in the United States. A complete historical review of investigations upon food and nutrition in this country would include numerous instances in which studies of food were incidental to other inquiries. A considerable amount of valuable information has been obtained by physicians, by State boards of health, and by specialists in physiology, hygiene, and dietetics. Some of the latter inquiries are of especial value, as, for instance, those of Professor Chittenden, of Yale University. Of noteworthy importance are the studies of the chemical composition and adulteration of food materials made in the Division of Chemistry of the Department of Agriculture by Prof. H. W. Wiley and others.

The purpose of the present article is to refer to the special work which has developed into the cooperative inquiry now being carried on under the auspices of the Department of Agriculture, through the Office of Experiment Stations, and to describe some of the methods, progress, and results of that enterprise. This inquiry had its inception in a study of the chemical composition of food-fishes and inver-

tebrates undertaken by Prof. W. O. Atwater in 1877, and continued until 1882, in the laboratory of Wesleyan University, at the instance of Prof. S. F. Baird, secretary of the Smithsonian Institution and United States Commissioner of Fish and Fisheries. In connection with this work, similar investigations of other animal and some vegetable products were undertaken a little later (1884) on behalf of the United States National Museum. About the same time (1886) the first extended inquiry regarding the statistics of food consumption in the United States was undertaken by Hon. Carroll D. Wright, as chief of the Massachusetts Bureau of Statistics of Labor, and the chemical results were computed and reported by Professor Atwater. In 1890 the Storrs Experiment Station, under the direction of Professor Atwater, in cooperation with Hon. Carroll D. Wright as United States Commissioner of Labor, began a series of dietary studies which continued for several years.

Nearly all the work of these inquiries was done at Wesleyan University, and, with the exception of those under the auspices of the Massachusetts Bureau and United States Department of Labor and the Storrs Experiment Station, the larger share of the expense was borne by private individuals. Associated with Professor Atwater in the inquiries were Messrs. C. D. Woods, now professor in the University of Maine and director of the experiment station of that State; J. H. Long, now professor in the Northwestern University Medical School; E. B. Voorhees, now professor in Rutgers College and director of the New Jersey experiment stations; J. M. Bartlett, now chemist of the Maine Experiment Station; G. P. Merrill, now curator of the United States National Museum and professor in Columbian University; W. H. Jordan, late of the Maine State University and Experiment Station and now director of the New York State Experiment Station; E. B. Rockwood, now professor and dean of the medical school of the University of Iowa; G. Gehring, since deceased, and the late Prof. H. B. Gibson, of the University of Missouri, besides others who also rendered most valuable service. Among those who supported the earlier inquiries by private gifts were Messrs. F. B. Thurber, E. G. Blackford, and Mark Hoyt, of New York City; G. E. Roberts, of Boston, and J. W. Alsop, H. G. Hubbard, A. R. Crittenden, E. K. Hubbard, and I. E. Palmer, of Middletown, Conn. It is interesting to note, in these earlier studies, the same principle of the encouragement of research by public funds and official recognition, when it was aided by private support, as is now being followed in the nutrition investigations under the auspices of the Department of Agriculture.

The results of these inquiries gradually came into notice. The bearing of such research upon household, agricultural, and national economics became evident, and as early as 1890 steps were taken to secure an appropriation from Congress in order to enlarge their scope and useful-

ness, but nothing definite was accomplished until 1894. In that year the experiment stations were authorized by Congress to cooperate with the Secretary of Agriculture in the study of the food and nutrition of man, and were called upon to report to him the results of such investigations as they might carry out. At the same time Congress provided a special appropriation to enable the Secretary of Agriculture to prosecute inquiries in this direction.

GENERAL LINES OF WORK.

The general lines along which the investigations have been conducted may be briefly stated as follows:

Observations have been made on the nutritive value and cost of different food materials in various localities in the United States.

Studies have been made of actual dietaries in order to learn the kinds and amounts of food materials consumed by persons in different localities, of different occupations, ages, and sex, and under varying conditions.

The digestibility of certain articles of food, especially cereal products and meats, has been studied, and comparisons have been made between the cheaper and more expensive foods to determine the relative effect of their use on health and comfort.

Studies have been conducted to determine the losses in nutritive value from various modes of cooking and to find out the most economical methods for utilizing different food materials.

Metabolism experiments have been made with the respiration calorimeter. The principal theme has been the transformation of the energy of food materials in the body and the use which the body makes of the energy so transformed. One important topic has been the relation of muscular work to digestibility and metabolism. The amounts of food consumed and metabolized by men under different conditions of work and rest have been observed. The fuel values of the fats and carbohydrates have been compared.

Determinations of the heats of combustion of food materials have been made with the bomb calorimeter.

Methods of investigation are being studied with reference to their improvement, and constant effort is being made to devise better forms of apparatus. The most important improvements in apparatus thus far made have been the devising and construction of the Atwater-Rosa respiration calorimeter and the improving of the bomb calorimeter by Atwater and associates.

The fact was early recognized that compilations and summaries of the investigations which have been carried on in Europe and this country were necessary. In order to conduct any kind of research most efficiently it is necessary to know what has been accomplished by others in order that the investigator may profit by their results and

that an unnecessary duplication of effort may be avoided. Furthermore, summaries of previous investigations are of great value in suggesting lines of research and in awakening the interest of investigators by showing past achievements.

The current literature of the nutrition of man, which is now quite voluminous, is being regularly followed up, and such abstracts and compilations are being made as will promote the interests of the investigations.

The rapid accumulation of material which must be made ready for publication in both technical and popular form necessitates a large amount of editorial work. The correspondence connected with these investigations has grown to very considerable dimensions.

ORGANIZATION OF THE WORK.

The nutrition investigations of the Department of Agriculture are conducted through the Office of Experiment Stations, the general supevision of these investigations having been assigned by the Secretary of Agriculture to the Director of that Office. The immediate supervision of this enterprise has been intrusted to Prof. W. O. Atwater, as special agent in charge of nutrition investigations. Professor Atwater's headquarters are at Middletown, Conn. The administrative and editorial work connected with these investigations is conducted at Washington and Middletown. The investigations themselves are conducted in different places, the general policy being to make particular institutions centers of investigation in special lines. The cooperating institutions have in most cases contributed material assistance, especially as regards laboratory rooms and appliances and the services of skilled investigators. This method of cooperation has some very decided advantages, particularly in the fact that many different institutions, representing the varied interests of people in widely separate regions, are united in the study of prevalent conditions and in efforts toward improvement. Besides this, the funds provided by the Department are used economically and are supplemented by the resources of the institutions and often by means from other sources. While a large amount of work is being done, the interest is widely extended and the results are given a greater practical usefulness.

WORK OF THE WASHINGTON OFFICE.

Besides the general supervision of the plans and expenditures, the work of the Washington Office in relation to the nutrition investigations has included the preparation of popular bulletins; the compilation of technical summaries of investigations; editorial work in perfecting the details of reports of investigations; collection of bibliographical data; the abstracting of the literature of nutrition, partly for publication in the Experiment Station Record; the conducting of

a large correspondence growing out of nutrition investigations, and the distribution of publications on this subject. This work is in charge of Dr. C. F. Langworthy. The following publications have been prepared in this Office by Dr. Langworthy: Farmers' Bulletin No. 74, Milk as Food; No. 85, Fish as Food; No. 128, Eggs and their uses as Food; and No. 58, Appendix, Soy Beans as Food for Man; Circular No. 43, Food Nutrients—Food Economy; Circular No. 46, The Function and uses of Food; and Yearbook articles entitled Food for Man and The Value of Potatoes as Food. The series of farmers' bulletins entitled Experiment Station Work have contained many articles on food and nutrition which has summarized the investigations on this subject conducted by different experiment stations. In the Experiment Station Record the results of current investigations on food and nutrition conducted in this and other countries are summarized. The following publications, prepared by different authors, have been issued by this Office, which have been for the most part based on nutrition investigations in this country and abroad: Farmers' Bulletin No. 93, Sugar as Food, by Mary Hinman Abel; Farmers' Bulletin No. 112, Bread and the Principles of Bread Making, by Helen W. Atwater; Farmers' Bulletin No. 121, Beans, Peas, and Other Legumes as Foods, by Mary Hinman Abel; and Office of Experiment Stations Bulletin No. 56, History and Present Status of Instruction in Cooking in the Public Schools of New York City, by Mrs. Louise E. Hogan, with an introduction by A. C. True; Yearbook, 1899, Development of Nutrition Investigations of the Department of Agriculture, by A. C. True and R. D. Milner.

WORK OF THE MIDDLETOWN OFFICE.

The work of the office of the special agent in charge of the nutrition investigations at Middletown, Conn., has included the planning and direct supervision of these investigations in different parts of the country, the conducting of special investigations with the respiration calorimeter and bomb calorimeter, the compilation of the results of nutrition investigations in this country and abroad, and a large correspondence relating to these investigations. The special investigations carried on here in cooperation with Wesleyan University and the Storrs Experiment Station are briefly described on page 445.

INVESTIGATIONS IN DIFFERENT STATES.

The nutrition investigations conducted in cooperation with colleges, experiment stations, and other agencies in the different States are briefly described in the following pages:

ALABAMA.

Investigations in this State were carried on during the spring of 1895 and the winter of 1895–96 at the Normal and Agricultural Insti-

tute of Tuskegee, in cooperation with Prof. Booker T. Washington, and at the Alabama Polytechnic Institute and the Alabama Experiment Station, Auburn, in cooperation with Prof. B. B. Ross. The work covered a study of the food consumption of the negroes in the neighborhood of the "black belt" of Alabama, and of the chemical composition of the food materials used by negroes. The work was carried on under the immediate supervision of Prof. W. O. Atwater and Mr. Charles D. Woods, of Middletown, Conn., and was aided in many ways by Pres. W. L. Broun, of the Polytechnic Institute, at Auburn. The details of much of the work were in charge of Mr. H. M. Smith, of Middletown, Conn., and Mr. J. W. Hoffman, of the Tuskegee Institute.

The immediate purpose in conducting an inquiry into the food of the colored population of Alabama was to obtain information as to the kind, amounts, and composition of the food materials used. The ulterior purpose was to get light upon the hygienic and pecuniary economy of their diet, its deficiencies, and the ways in which it might be improved and the steps which should be taken to bring about an improvement.

Twenty dietary studies were made with different classes of negro families, from those who had felt the elevating influence of the Tuskegee Institute to families of plantation laborers in the poorest of circumstances. As a result of the studies it was found that the characteristic "hog and hominy" diet in common use was markedly deficient in protein, while furnishing, in many instances, a large amount of energy.

The investigations were not continued after the close of the fiscal year ended June 30, 1896. The results of the investigations are reported in Bulletin No. 38 of this Office on Dietary Studies with Reference to the Food of the Negro in Alabama in 1895 and 1896, by W. O. Atwater and C. D. Woods.

CALIFORNIA.

A series of investigations was begun in cooperation with the University of California in 1896, and is being carried on at the present time. The work in charge of Prof. M. E. Jaffa has included dietary studies of infants, athletes, professional men, fruitarians, and Chinese; digestion experiments with an infant and a fruitarian, and analyses of California food materials. Professor Jaffa has been aided by Messrs. G. E. Colby, F. J. Snow, R. R. Bishop, and C. L. Biedenbach. Valuable aid in the work with the Chinese was also received from Mr. W. N. Fong, instructor in Oriental languages at the University of California.

Besides the lines of inquiry just mentioned, Mr. W. C. Blasdale, instructor in chemistry at the university, made a study of the composition of Chinese vegetable food materials. The work is being continued by Professor Jaffa at the present time.

DIETARY STUDIES.

The results of fifteen studies have already been published in bulletins of the Office of Experiment Stations. A study made with a football team in active training is of interest. It was undertaken especially to secure information regarding the food consumption of men performing severe work under known conditions.

Such data are of value in determining dietary standards, especially the relative amounts of nutrients required by persons performing different amounts of muscular work. A study of the food consumption of the family of a professional man adds further data to those already accumulated in this line. The dietary studies with infants have been by far the most detailed of any which have been carried on in this country, covering in one case the total food consumed by a child from the second to the thirteenth month of its age. Four studies have been reported. The results are of value in throwing light upon the question of the relative food consumption of children of different ages, and affording material for computing dietary standards for infants.

Rice is popularly supposed to constitute the chief food of Chinese, not only at home but in this country. In order to obtain information regarding the peculiarities of the diet of the Chinese in this country three studies were made of Chinese living in or near San Francisco. The results indicate that the diet is not as unusual as is ordinarily supposed, and that while rice forms a considerable portion of the rations their diet can by no means be considered as even approaching a vegetarian diet. The rice constituted between one-third and one-half of the total food consumed, and held much the same relation to the total food of the Chinese as do bread and other cereals, starches, etc., to the total food of the ordinary American family.

While fruit and nuts are ordinarily considered in the light of accessory or supplementary foods, there are those who live entirely upon these articles of diet. In order to find the actual consumption of nutrients and energy by such persons studies were made of the food consumption of a family living almost entirely upon fruits and nuts. The investigation is still being pursued and the results thus far obtained are not sufficient to warrant any definite conclusions. It is very noticeable, however, that the actual amounts of nutrients and energy in the diets of the persons studied were much smaller than is ordinarily found in diets of average persons under like conditions of age, sex, and muscular activity. In all seven dietary studies have been made with fruitarians.

DIGESTION EXPERIMENTS.

Two digestion experiments have been made; one with an infant and one with a child living upon a diet made up entirely of fruits and

nuts. The results of the experiment with the infant substantiate those of similar experiments elsewhere. The digestion experiment with a fruit and nut diet seems to indicate that the nutrients and energy in such a diet may not be much below that of the nutrients and energy in the average mixed diet. In some of the work the metabolism of nitrogen was also studied.

COMPOSITION OF CALIFORNIA FOOD MATERIALS.

In connection with the investigations analyses of a considerable number of California food materials, more especially fruits and Chinese food materials, have been made. Reference has already been made to the quite detailed study of the composition and economic value of the Chinese vegetable food materials found in the Chinese markets of San Francisco.

PUBLICATIONS.

The results thus far published are given in the following bulletins of the Office of Experiment Stations: Bul. No. 68, A Description of Some Chinese Vegetable Food Materials and their Economic and Nutritive Value, by W. C. Blasdale; Bul. No. 84, Nutrition Investigations at the California Agricultural Experiment Station, 1896–1898, by M. E. Jaffa; and Bul. No. 107, Nutrition Investigations Among Fruitarians and Chinese at the California Agricultural Experiment Station, 1898–1901, by M. E. Jaffa.

CONNECTICUT.

The investigations in this State have been carried on in connection with the Storrs Experiment Station and Wesleyan University, and under the direction of Prof. W. O. Atwater, who, as special agent in charge of the nutrition investigations, also has the general oversight of the work in other parts of the country. Prof. C. D. Woods, now of the Maine State University and Experiment Station; Prof. E. B. Rosa, of Wesleyan University; Dr. F. G. Benedict, and Mr. A. P. Bryant have shared in the direction of the work. The details of the inquiry have been carried out with the assistance of a considerable number of persons, several of whom have been associated with the Storrs Experiment Station and Wesleyan University.

The chief line of inquiry has been the study of the metabolism of matter and energy in the human body by means of the respiration calorimeter, briefly described on page 446. In addition there has been a considerable amount of work along other lines, including the compilation of results of earlier investigations and other literary work, digestion experiments, analyses of food materials and excretory products, studies of dietaries, and the developing of apparatus and methods.

The Storrs Experiment Station had already done considerable work along similar lines before the institution of the national inquiry into the food and nutrition of man, and has continued such work from the beginning of this inquiry to the present time. Since 1895 the State has annually appropriated $1,800 to the station, the major portion of which has been available for the nutrition investigations.

IMPROVEMENT OF APPARATUS—BOMB AND RESPIRATION CALORIMETERS.

One important function of food is to furnish energy to the body. For a thorough study of the laws of nutrition, therefore, and of the uses and nutritive values of food, there must be a means of determining the amounts of potential energy in the food consumed and in the products formed from the food by the body. Since different forms of energy may be transformed into heat, the energy of a substance may be expressed in terms of heat, and therefore the potential energy of a substance may be measured by the heat developed when the substance is burned in oxygen. In the investigations conducted under the auspices of the United States Department of Agriculture a very satisfactory method is employed whereby the amount of heat thus developed by food materials is determined. The result obtained in this way is called the "heat of combustion" of the material burned. The apparatus used for this purpose is called a calorimeter. Various forms of calorimeter have been devised. That form now in use in connection with the nutrition investigations of this Office is called a bomb calorimeter. The early work done by the Connecticut Storrs Station along this line was with a Stohmann calorimeter, a modification of an earlier form devised by Thompson. This apparatus proved unsatisfactory, and the attempt was made to secure a better one. The bomb calorimeter devised by Berthelot was superior, but was very costly because of the large amount of platinum used in its construction. With the aid of Professor Hempel, of Dresden, Professor Atwater and his associates succeeded in modifying the Berthelot apparatus, especially with regard to the amount of platinum used, so that a very accurate and satisfactory calorimeter has been obtained at a much lower cost. By the use of this apparatus the heats of combustion of a large number of different food materials have been determined.

Studies of some of the more fundamental laws of animal nutrition have been carried on for the purpose of determining what uses the body makes of its food under different conditions. Special inquiries of this nature were begun by Professor Atwater in 1892, by means of an apparatus known as a respiration calorimeter, so arranged that a man may spend a number of days in comparative comfort within it, and so manipulated that the metabolism of both matter and energy in his body may be determined. In devising and perfecting the apparatus and in carrying out the investigations with relation to the measure-

ments of heat and mechanical work, Professor Atwater was assisted by Dr. E. B. Rosa, professor of physics in Wesleyan University, and others. Several years were spent in the development of this apparatus and the elaboration of methods of experimenting with it.

The Atwater-Rosa respiration calorimeter is an air-tight copper box inclosed in zinc and wooden cases and of such a size that a man can remain in it in comparative comfort for a number of days. In experiments conducted at Middletown, Conn., a man has remained in the apparatus some two weeks. The copper box or chamber is some 7 feet long, 4 feet wide, and 6 feet high. It is provided with a folding cot, table, and chair. Food and other necessary articles are passed in and out through a tube at one side of the chamber. A window in front admits light, and the man inside of the chamber can communicate with those outside by means of a telephone. The chamber is supplied with fresh air, and the amount and composition of the air which enters and leaves it are determined, the latter containing the products of respiration. The amount and composition of the food and excretory products are also determined. The heat given off by the man's body is measured, as well as the heat value of the food and excreta. A stream of cold water of known temperature and volume circulates through the interior of the chamber in pipes. It absorbs the heat given off by the man's body, and permits of its measurement, at the same time serving to keep the temperature of the interior cool.

At the present time the respiration calorimeter is being much improved, and it is expected that in the near future it may be made into a so-called closed circuit apparatus, in which the air drawn from the respiration chamber is freed from its carbon dioxid, oxygen added, and the air returned to the chamber. When this is accomplished, the apparatus will permit of still more valuable and accurate research.

METABOLISM EXPERIMENTS.

The development of apparatus and methods has been both costly and time-consuming, but the results bid fair to be of no little value in determining the physiological demands of the human body under different conditions, in studying the way different foods are used in the body, and in carrying out various abstract lines of physiological research. In some of the experiments the subject worked very hard driving a stationary bicycle; in others, he worked as little as possible, spending his time in reading or writing. In the work experiments the amount of work performed was measured. Such experiments show the value of different foods for the production of work and serve as a means for judging the power of the human body considered as a machine. The results of nineteen experiments covering sixty-five days have already been published in bulletins of the Office of Experiment

Stations, and the results of fourteen further experiments covering forty-one days await publication.

DIETARY STUDIES.

Although the Storrs Experiment Station has for a considerable number of years studied the food consumption of families, boarding houses, clubs, institutions, and the like, the number of dietary studies which has been made in cooperation with the Department has not been large. In 1897 a study was made of the food consumption of the Yale University boat crew while in training at New Haven, and later immediately before the race with Harvard University on the Thames near New London. The results of these studies will be referred to in connection with those of similar studies made at the same time with the Harvard University boat crews, and referred to in the section "Nutrition investigations in Massachusetts" (p. 453).

An inquiry was also made concerning the food consumption, digestion, and nitrogen metabolism of bicyclists under conditions of unusual and severe mental and muscular strain. The four studies which were carried on were with three different men. The food eaten was carefully weighed, sampled, and analyzed, and samples were taken of the excretory products. The men were engaged in a six-day bicycle race and were at work from twelve to twenty-three hours each day. The results, therefore, are of considerable interest in showing the food demands of persons under such extraordinary conditions. As was to be expected, the quantity of food consumed was large, but not nearly as large as would be necessary in order to cover the demands of the body under the circumstances. Unfortunately, no estimate could be made of the amount of body fat lost. Prof. R. C. Carpenter, of Cornell University, made estimates of the amount of work done by the riders, which showed that their efficiency must have been far greater than that of any heat engine that has yet been devised.

DIGESTION EXPERIMENTS.

In connection with the metabolism experiments with the respiration calorimeter above mentioned, digestion experiments have been carried on for the purpose of studying the digestibility of the food used in the metabolism experiments and throwing light upon the digestibility of different rations under different conditions. The detailed results of much of this work have not yet been published, but the work has served an important purpose as a means of verifying proposed factors for the digestibility of different classes of food materials, and also the factors proposed for heats of combustion and for fuel value.

ANALYSES OF FOOD MATERIALS AND DETERMINATION OF HEATS OF COMBUSTION.

The metabolism experiments, dietary studies, and digestion experiments have involved a considerable amount of analytical work and the heats of combustion of a large number of samples of food have also been determined. These determinations of heats of combustion are made by the bomb calorimeter, and considerable attention has been devoted to the perfection of the apparatus and methods by which it is possible to determine the total or potential energy in a given material with ease and accuracy. A good deal of attention has been paid to the improvement of the bomb calorimeter and accessory apparatus by Mr. O. S. Blakeslee, formerly mechanician at Wesleyan University, to whom much of the credit belongs.

MISCELLANEOUS INQUIRIES.

In addition to the lines of inquiry above stated a short study was made of the composition of raw and cooked potatoes and the losses during cooking. This study was made for the purpose of duplicating some of the results obtained by Professor Snyder at the Minnesota Experiment Station (see p. 455).

Considerable attention has also been given to analytical and experimental methods involved in the various lines of investigation which have been carried on in Connecticut, the detailed enumeration of which is unnecessary.

PUBLICATIONS.

The results of above investigations are published in the following bulletins of the Office of Experiment Stations: Bul. No. 44, Report of Preliminary Investigations on the Metabolism of Nitrogen and Carbon in the Human Organism, by W. O. Atwater, C. D. Woods, and F. G. Benedict; Bul. No. 63, Description of a New Respiration Calorimeter and Experiments on the Conservation of Energy in the Human Body, by W. O. Atwater and E. B. Rosa; Bul. No. 69, Experiments on Metabolism of Matter and Energy in the Human Body, by W. O. Atwater and F. G. Benedict, with the cooperation of A. W. Smith and A. P. Bryant; Bul. No. 109, Further Experiments on the Metabolism of Matter and Energy in the Human Body, by W. O. Atwater and F. G. Benedict, with the cooperation of A. P. Bryant, A. W. Smith, and J. F. Snell; Bul. No. 75, Dietary Studies of University Boat Crews, by W. O. Atwater and A. P. Bryant; Bul. No. 98, The Effect of Severe and Prolonged Muscular Work on Food Consumption, Digestion, and Metabolism, by W. O. Atwater and H. C. Sherman, and Bul. No. 43 (third article), Losses in Boiling Vegetables and the Composi-

tion and Digestibility of Potatoes and Eggs, by H. Snyder, Almah J. Frisby, and A. P. Bryant. In addition to these there is a considerable amount of material which has not yet been published.

The bulletins reporting compilations of the work of earlier investigators include Office of Experiment Stations Bulletin No. 21, The Method and Results of Investigations on the Chemistry and Economy of Food, by W. O. Atwater; Bulletin No. 28, The Chemical Composition of American Food Materials, by W. O. Atwater and Chas. D. Woods; a revision of this bulletin by W. O. Atwater and A. P. Bryant; Bulletin No. 45, A Digest of Metabolism Experiments, in which the Balance of Income and Outgo was Determined, by W. O. Atwater and C. F. Langworthy. Popular summaries, published as Farmers' Bulletins by the Department of Agriculture, have been prepared as follows: Farmers' Bulletin No. 23, Foods: Nutritive Value and Cost, by W. O. Atwater; Farmers' Bulletin No. 34, Meats: Composition and Cooking, by Chas. D. Woods; Farmers' Bulletin No. 142, The Nutritive and Economic Value of Food, by W. O. Atwater; Food and Diet, Yearbook, 1894; and Some Results of Dietary Studies, A. P. Bryant, Yearbook, 1898.

ILLINOIS.

Nutrition investigations have been carried on in cooperation with the Hull House and the Lewis Institute of Chicago and the University of Illinois. The lines of work undertaken have been dietary studies, investigations of food and milk supply of Chicago, losses in cooking meat, digestion experiments in which meat formed a considerable part of the diet, and analyses of food materials.

The work in Chicago was under the immediate direction of Miss Jane Addams, of Hull House, and Prof. G. N. Carman, director of Lewis Institute. The work at the University of Illinois was carried on by Prof. H. S. Grindley.

DIETARY STUDIES.

The dietary studies were carried on mainly for the purpose of studying the food consumption of persons of foreign birth or parentage residing in congested districts of Chicago. Fifty such studies were made among families of Italians, French Canadians, Russian Jews, and Bohemians. The details of these studies were carried on by Miss Caroline Hunt, although valuable aid was received at the outset from Mr. H. M. Smith, of Middletown, Conn. The results seem to indicate that the diet of foreigners in this country approaches more and more nearly that of the average American diet the longer they have resided in this country. In addition to these three dietary studies were made of well-to-do professional men residing in Chicago and two were carried on by Professor Grindley, in connection with his work at the University of Illinois. In these he was assisted by Mr. J. L. Sammis and Mr. E. A. Paul.

LOSSES IN COOKING MEAT.

In order to study the losses which may occur during the frying, roasting, and boiling of meat, Professor Grindley began in 1898 a series of experiments which he has continued to the present time. The results of 25 experiments, 23 of which were in duplicate, have already been published; the results of 24 more, all in duplicate, await publication. These experiments have been made with frying and boiling; with lean and fat meat; and with beef, veal, and mutton. The results indicate that there was no great loss during the process of frying and roasting meat, and that in boiling meat there was no loss provided the liquor in which the meat is cooked is utilized for gravy or in other ways. If the liquor is not used the loss may amount to considerable. These cooking experiments have involved a very large number of analyses, not only of raw and cooked meat, but of meat broths. The method of experimenting had also to be elaborated. In the prosecution of this work Professor Grindley received the valuable cooperation of Mr. H. McCormack and Mr. H. C. Porter, not only in the experiments just described, but in the digestion experiments.

DIGESTION EXPERIMENTS.

Besides the cooking experiments, Professor Grindley has made up to the present time 37 digestion experiments in which meat forms an important part of the diet. In some of these experiments, indeed, only sufficient other food materials were used to make the diet palatable. The meat used has been cooked in different ways, and has been of different degrees of fatness. The results have not yet been published. All of these 37 experiments are also nitrogen metabolism experiments, since the nitrogen of income and outgo was determined.

These experiments were carried on with men, and may be called natural-digestion experiments. In addition to these natural-digestion experiments a large number of artificial experiments have been made, in which the digestibility of different kinds of meat, different degrees of fatness, and cooked in different ways has been studied by means of digestion in pepsin solution, and the time required for complete digestion noted. The results of these experiments, like those of the natural-digestion experiments, still await publication.

The number of analyses of food materials, excretory products, and residues from artificial-digestion experiments has been very large. The results of the investigations can hardly fail to be of far-reaching value.

PUBLICATIONS.

The results of so much of these investigations as has been published are reported in the following bulletins of the Office of Experiment

Stations: Bul. No. 55, Dietary Studies in Chicago in 1895 and 1896, conducted with the cooperation of Jane Addams and Caroline L. Hunt, of Hull House, reported by W. O. Atwater and A. P. Bryant; Bul. No. 91, Nutrition Investigations at the University of Illinois, North Dakota Agricultural College, and Lake Erie College, Ohio, 1896–1900, by H. S. Grindley and J. L. Sammis, E. F. Ladd, Isabel Bevier, and Elizabeth C. Sprague. (The first part only of this bulletin is descriptive of work in Illinois.) Bul. No. 102, Experiments on the Losses in Cooking Meat, 1898–1900, by H. S. Grindley, with the cooperation of H. McCormack, and H. C. Porter.

INDIANA.

The investigations in Indiana were made at Purdue University in 1895 and 1896 by Prof. W. E. Stone. They comprised two studies of dietaries. The investigation has not been continued since 1896. In carrying on these dietary studies, Professor Stone received the efficient aid of Mr. H. M. Smith, of Middletown, Conn. The results of the investigation are published in the following bulletin of the Office of Experiment Stations: Bul. No. 32, Dietary Studies at Purdue University, Lafayette, Ind., in 1895, by W. E. Stone.

MAINE.

The investigations in this State have been carried on at the University of Maine and the Maine Experiment Station by Prof. W. H. Jordan and Prof. C. D. Woods. The lines followed have been the study of dietaries and study of the digestibility and nutritive value of bread. A considerable amount of time has also been devoted to the study of experimental methods. In the prosecution of the work Professor Jordan and Professor Woods had the cooperation of Mr. F. C. Moulton and Mr. L. H. Merrill.

DIETARY STUDIES.

In 1895 a series of dietary studies was made of the students at the University of Maine. The attempt was made to control the sources of protein, furnishing it in both cheap and expensive forms. The influence of an abundance of milk in the dietary was also studied. The results obtained were compared with those of a dietary study made under normal conditions. The studies were made at different times of year and observations were made of the effect of temperature upon food consumption. It was found that there was much less food consumed in warm weather than in cold. The free use of milk did not seem to increase the total amount of nutrients eaten; the extra amount of milk consumed apparently replaced other food materials. The dietaries in which the milk was more abundant were less costly

than those in which but little milk was used. The cost of the ration varied in the different studies from 25 cents to 34 cents per man per day. During the progress of the studies a large number of food materials and excretory products were sampled and analyzed.

STUDIES OF DIGESTIBILITY AND NUTRITIVE VALUE OF BREAD.

These studies are carried on by Professor Woods. They were begun in 1895 and are being continued at the present time. The plan of the investigation involved a study of the digestibility of bread made from different kinds of flour. Twenty-four digestion experiments with healthy men were carried on, 13 with bread made from fine wheat flour, 5 with bread made from whole-wheat flour, and 6 with bread made from graham flour. Similar experiments are being continued at the present time, but the results thus far obtained are not sufficient for drawing definite conclusions regarding the relative digestibility of bread made from different kinds of wheat flour.

In order to study the true digestibility of bread, it became necessary to determine as accurately as possible the quantity of metabolic products in the feces; a considerable amount of experimental study was given this question.

The digestibility of the protein of the bread was also determined in a number of cases by artificial digestion in pepsin solution.

Another line of inquiry relating to the nutritive value of bread was the difference in the composition of the bread made with skim milk instead of water. A still further inquiry was that regarding the losses in bread making. The results of 6 experiments in which the loss of nutritive material during baking was studied indicate a loss of not far from 2 per cent of the dry material. This loss falls chiefly upon the fats and carbohydrates; the results agree quite closely with those obtained in experiments in New Jersey. These investigations involved a large number of chemical analyses.

PUBLICATIONS.

The results of the investigations in Maine are published in the following bulletins of the Office of Experiment Stations: No. 37, Dietary Studies at the Maine State College in 1895, by Whitman H. Jordan, Director of Maine Agricultural Experiment Station; and No. 85, A Report of Investigations on the Digestibility and Nutritive Value of Bread, by Charles D. Woods, director, and L. H. Merrill, chemist, Maine Agricultural Experiment Station. Other results await publication.

MASSACHUSETTS.

In the spring of 1898 Prof. W. O. Atwater and Mr. A. P. Bryant, assisted by some other members of the force of the Office of Experiment Stations, made a study of the food consumption of the "varsity"

and freshman crews of Harvard University and that of an individual member of one of the crews. In the prosecution of these studies of the Harvard crews the cooperation of Dr. G. W. Fitz, of the Lawrence Scientific School, was obtained. These studies and those of the Yale crews previously mentioned (p. 448) were carried on at the same time during the latter part of the training periods at Cambridge and New Haven, and later at Gales Ferry immediately before the race. They were undertaken primarily to secure data regarding the food requirements of men performing severe muscular work. Few statistics of the dietaries of persons thus engaged are available, and for this reason the results of this investigation are of especial interest. The regular course of diet and exercise pursued by boat crews in training and the conditions under which the men live at such times afford favorable opportunity for securing reliable data.

At the instigation of the Harvard athletic committee, through Dr. E. A. Darling, an investigation by Prof. W. O. Atwater and Dr. F. G. Benedict was carried on in order to obtain information regarding the food consumed and digested by the Harvard crew. This investigation was made with four members of the crew while at Gales Ferry during the last days of training previous to their race with Yale in June, 1900. The samples of food and the feces and urine were analyzed in the chemical laboratory of Wesleyan University.

The data obtained include the amounts and composition of the food eaten and of the solid and liquid excreta during the same period. The investigation thus includes a dietary study, a digestion experiment, a study of the excreta, and a nitrogen metabolism experiment. The results indicate that the four ate per man about as much as the Harvard and Yale crews in 1898, and that their food contained about 50 per cent more protein and 16 per cent more energy than that of men at ordinary occupation in the United States whose dietaries have been studied. They also digested their food just about as completely as the average man does.

Under the direction of Professor Atwater a study was made in 1900–1901 of the dietaries of ten students boarding at one of the large refectories at Harvard University, by Mr. Edward Mallinckrodt, jr., with the cooperation of Prof. C. R. Sanger. Most of the students under observation were obliged to live economically, and the amount of money spent for food by them was quite limited. The studies were carried on during three periods of three weeks each—one in the late fall, one in winter, and one in late spring. Records of the physical condition of the subjects were made during each experimental period. The data of the investigation, which have not yet been published, will, it is expected, serve as an important contribution to the subject of food consumption of persons of sedentary habits.

The investigations with the Harvard and Yale University crews in

1898 were published in Office of Experiment Stations Bulletin No. 75, Dietary Studies of University Boat Crews, by W. O. Atwater and A. P. Bryant.

MINNESOTA.

The investigations in this State have been carried on in cooperation with the University of Minnesota and the State Agricultural Experiment Station by Prof. Harry Snyder. The principal lines followed have been the study of losses in cooking vegetables and in baking bread, and a study of the composition and digestibility of bread made from wheat milled in different ways. The investigations were begun in 1895 and are still in progress.

LOSSES IN COOKING VEGETABLES.

Professor Snyder made a study of the losses in nutritive material during the boiling of potatoes, carrots, and cabbage, and found that, unless care were taken, the loss in this way might amount to a considerable percentage of the total nutrients present. The investigations in this particular line were not continued.

LOSSES IN BAKING BREAD.

This investigation belongs to a series of inquiries into the nutritive value, digestibility, and economy of cereals and cereal products and foods prepared from them. The study included an investigation of the loss of dry matter, carbon as carbon dioxid, alcohol or other volatile compounds, loss of nitrogen, changes in the solubility of the fat, and possible loss. Of the conclusions reached, perhaps the most important is that "when special care was taken in bread making the analysis of flour of the bread showed an average loss of 1.58 per cent of the total dry matter of the flour." It is to be inferred that this loss might be at times materially larger.

DIGESTION EXPERIMENTS WITH BREAD.

These have included a large number of experiments upon bread made from different kinds and grades of flour, and with different proportions of protein and starch. The results of 31 experiments have already been published and others await publication. During the prosecution of these studies a large number of analyses of different grades of flour and bread and of excretory products have been made. A large amount of this investigation is carried on coordinately with a similar investigation in Maine, under the direction of Professor Woods.

In view of the continuance of the experiments we would hardly be warranted in drawing definite conclusions from the results thus far obtained. The indication, however, is that there is little difference in

the nutritive value of fine or patent roller process, entire wheat, and Graham flour. Although the two latter kinds contain rather more protein than the patent flour, this protein is rather less digestible, so that the quantity of protein actually available in the flour per pound does not vary greatly in the different grades.

Professor Snyder also made experiments upon the relative digestibility of large and small rations. It was found that a ration which was probably insufficient for the physiological needs of the subject was slightly more completely digested than a larger ration. One experiment was made on the digestibility of potatoes in a simple diet.

MISCELLANEOUS TOPICS.

In the prosecution of the investigations a number of minor points have been considered. Among these are the production of acids and of soluble carbohydrates in bread making, the behavior of the proteids of the wheat flour and other products; the quality of bread as affected by increasing or diminishing the proportion of starch in the flour; the effect of cold and warm flours in bread making; the influence of prolonged heating of flour upon the quality of bread; the effect of blending—i. e., mixing various grades of flours—upon the quality of bread, and various minor topics connected with the analytical and experimental methods.

PUBLICATIONS.

The results of these investigations are reported in the following publications of the Office of Experiment Stations: Bul. No. 43, Losses in Boiling Vegetables and the Composition and Digestibility of Potatoes and Eggs, by H. Snyder, Almah J. Frisby, and A. P. Bryant. (The material also included in this bulletin reported by Dr. Frisby and Mr. Bryant was descriptive of similar experiments carried on at Middletown, Conn.) Bul. No. 67, Studies on Bread and Bread Making, by H. Snyder and L. A. Voorhees. (The portion of this bulletin reported by Mr. Voorhees has to do with results of similar experiments carried on in New Jersey.) Bul. No. 101, Studies on Bread and Bread Making at the University of Minnesota in 1899 and 1900, by Harry Snyder.

MISSOURI.

Investigations in this State were carried on at the University of Missouri by H. B. Gibson with the cooperation of S. Calvert and D. W. May. The investigations were concluded at the end of a year by the untimely death of Professor Gibson. Two dietary studies of student clubs were reported and an investigation of the relative bread and meat consumption by families in the State of Missouri. The results of the dietary studies are of interest in adding data to our knowledge

of the food consumption of students' clubs. The investigation as to the relative consumption of different kinds of bread and meat showed that the consumption of pork was relatively larger and beef less in farmers' families than in families living in cities or large towns. The consumption of bread, however, did not differ materially in the two cases.

The results of this investigation are published in Bulletin No. 31 of the Office of Experiment Stations: Dietary Studies at the University of Missouri in 1895 and Data relating to Bread and Meat Consumption in Missouri, by H. B. Gibson, S. Calvert, and D. W. May, with comments by W. O. Atwater and C. D. Woods.

NEW JERSEY.

Investigations in this State were carried on at the New Jersey Agricultural Experiment Station by Prof. E. B. Voorhees, and afterwards by Mr. L. A. Voorhees. These investigations were begun in 1895–96, and continued until 1897–98. The lines of inquiry were the cost and composition of milk and bread in New Jersey, studies of relative cost of bread and raw ingredients from which it was made, and losses in baking bread; one dietary study was also made. The investigations include the analyses of a large number of samples of food materials.

THE COST AND COMPOSITION OF MILK AND BREAD.

These studies were carried on in various cities and towns in New Jersey and showed that the cost of milk and bread in New Jersey compared favorably with that in other States. There was, however, no relation found between the cost of these products and their composition, it frequently happening that the milk costing the most might be one of the lowest in nutritive value.

Several studies were made of the cost of raw ingredients used in baking bread and the price at which the bread was sold. The conclusions derived were that it must depend upon the consumer himself to determine whether it is more economical to purchase bread or purchase flour and other materials and incur the necessary expense involved in baking bread at home.

LOSSES IN BAKING BREAD.

A considerable number of experiments were made determining the losses in nutritive value during the process of bread making. The conclusions reached were that this loss can hardly be considered an important factor; little if any loss was found in carbohydrates, and the apparent loss of fat is thought to be largely due to mechanical inclosure of the fat particles during the process of baking, which affects the analysis but not the nutritive value.

DIETARY STUDIES.

The investigations in New Jersey include but one dietary study, and the results must be taken in connection with those of many other dietary studies before any conclusions can be drawn.

PUBLICATIONS.

The results of the investigations in this State have been published in the following bulletins of the Office of Experiment Stations: Bul. No. 35, Food and Nutrition Investigations in New Jersey in 1895 and 1896, by Edward B. Voorhees; Bul. No. 67, Studies on Bread and Bread Making, by Harry Snyder and L. A. Voorhees (only the latter part of this bulletin is devoted to the results of the nutrition investigations in New Jersey; the first part reports results of similar experiments made in Minnesota). Besides results published in these bulletins there are a few which still await publication.

NEW MEXICO.

Investigations in this Territory were made at the New Mexico College of Agriculture and Mechanic Arts and the Agricultural Experiment Station by Prof. Arthur Goss. The work was begun in the fiscal year 1895–96, and was continued two years. The lines of inquiry were the study of food consumption of native Mexican families, a study of the composition of native food materials, and especially native beef.

DIETARY STUDIES.

Dietary studies were carried on with four Mexican familes—three of them quite poor and one in more moderate circumstances. The results are of interest in showing that these people obtained approximately the average amount of nutrients and energy found in diets of persons with similar degrees of muscular activity, at a very small cost. The average cost per man per day was 7 cents. Many of the food materials used in these studies were quite different from those found in general use in this country.

STUDY OF THE COMPOSITION OF MEXICAN FOOD MATERIALS.

This line of inquiry involved the analyses of a considerable number of food materials used by native Mexicans as well as food materials in general use by all classes in that section. In addition to these analyses a side of a range steer raised in New Mexico was analyzed.

All of the analyses of meat showed an unusually small proportion of fat as compared with the average of similar cuts in meats grown in other sections of the United States, and especially those grown and fattened in Illinois and neighboring States. The proportion of protein, however, was not greatly different from that in average beef.

PUBLICATIONS.

The results of investigations are published in the following bulletins of the Office of Experiment Stations: Bul. No. 40, Dietary Studies in New Mexico in 1895, by Arthur Goss; Bul. No. 54, Nutrition Investigations in New Mexico in 1897, by Arthur Goss.

NEW YORK.

Investigations in this State have been carried on in cooperation with the New York Association for the Improvement of the Condition of the Poor and the New York Christian Alliance. The investigations have been quite largely confined to a study of the actual food consumption of families living in the congested districts of New York City, and have been carried on largely through the aid and cooperation of Dr. Isabelle Delaney. Dr. R. L. Slagle assisted at the outset and the investigation was under the immediate supervision of both Professor Atwater and Professor Woods. The work began in 1895 and continued until 1898. The results of the study have been of considerable value in showing the actual food consumption of persons with limited means. As a general thing the families were well nourished, but there was evident lack of knowledge of the nutritive value of food evinced in their purchases in many cases. An equal abundance of nutriment could have been obtained at a much reduced cost.

Some analyses of food materials were made at Middletown, Conn., in connection with this investigation, and all of the work of computations was likewise carried on at that place.

Sixty-two dietary studies have been made. Of these, results of 26 were published in Bulletin No. 46 of the Office of Experiment Stations: Dietary Studies in New York City in 1895 and 1896, by W. O. Atwater and C. D. Woods. The results of the remaining studies will, it is expected, soon be published.

In addition to the investigations just mentioned, Dr. H. C. Sherman, of Columbia University, formerly associated with the nutrition investigations in Middletown, Conn., is engaged in an abstract research concerning the metabolism of phosphorus and sulphur in the human body. Much of the actual work of investigation is carried on in the summer at Middletown, Conn. None of the results of this latter investigation has as yet been published.

Acting under a special authorization, Mrs. Louise E. Hogan studied the growth and present status of the teaching of cookery in the public schools of New York City. Her report also includes sample lessons, which show the course followed and gives examples of the exercises, both compositions and drawings prepared by the pupils. The report is prefaced by an introduction by Director A. C. True, and is published as Bulletin No. 56, History and Present Status of Instruction in Cooking

in the Public Schools of New York City, by Mrs. Louise E. Hogan, with an introduction by H. C. True, Ph. D.

NORTH DAKOTA.

During the fiscal year 1895–96 investigations were carried on at the North Dakota Agricultural College by Prof. E. F. Ladd, assisted by Miss Marie B. Senn. The investigation included a study of the food consumption of a club of young women students and a study of break and bread making. The latter investigation was not published in the bulletins of the Department. The results of the dietary study will be found in Bulletin 91 of the Office of Experiment Stations: Nutrition Investigations at the University of Illinois, North Dakota Agricultural College, and Lake Erie College, Ohio, 1896–1900, by H. S. Grindley and J. L. Sammis, E. F. Ladd, and Isabel Bevier and Elizabeth C. Sprague. (The work by Professor Ladd forms the second article of this bulletin.)

OHIO.

In cooperation with Lake Erie College, at Painesville, Ohio, dietary studies were made of women students in 1899–1900. The work was carried on by Prof. Isabel Bevier and Miss Elizabeth Sprague, who at that time were officially connected with the institution. Valuable assistance was rendered by President Mary Evans and Dean Luett P. Bently. The work, which was carried on during the fiscal year 1899–1900, consisted of a study of the food consumption of the young women at the commons, or boarding club, of the college. The object of the study was twofold. In the first place there was the desire to obtain data concerning the food consumption of young women students. In the second place there was the purpose to provide an appetizing and nutritious diet at a cost not exceeding 25 cents per woman per day. The taste of the students and the possibilities and limitations of the food supply were studied for some six weeks before the beginning of the dietary study proper, and an idea was thus obtained regarding the character of the dishes with which there was the least table and kitchen waste. The results of the study, together with a discussion of the results and a comparison with results of similar studies made elsewhere, are reported in Bulletin 91 of the Office of Experiment Stations: Nutrition Investigations at the University of Illinois, North Dakota Agricultural College, and Lake Erie College, Ohio, 1896–1900, by H. S. Grindley and J. L. Sammis, E. F. Ladd, and Isabel Bevier and Elizabeth C. Sprague.

PENNSYLVANIA.

The Department cooperated with the Pennsylvania College for Women, located at Pittsburg, in a series of investigations carried on by Miss Isabel Bevier, at that time professor of natural sciences in

the institution named. Six dietary studies—one of a professional man's family, four of mechanics' families, and one of a laborer's family—were reported, as well as a study of the composition and cost of bakers' bread in Pittsburg and the composition of bread in relation to the changes which the materials undergo in baking. In conducting this investigation, Miss Bevier was aided by the directors of Kingsley House, a college settlement of Pittsburg. Miss L. P. Meloy and Miss E. R. Evans rendered much assistance in the practical details of the work. The investigations were published as Bulletin No. 52, Nutrition Investigations in Pittsburg, Pa., 1894–1896.

TENNESSEE.

Investigations in this State have been carried on in cooperation with the University of Tennessee by Prof. Charles E. Wait. Professor Wait has had the assistance of Messrs. C. O. Hill, J. O. La Bach, C. A. Mooers, W. H. Gildersleeve, and W. K. Hunter. Valuable assistance at the beginning of the work was rendered by Mr. H. M. Smith, then of Middletown, Conn. The work was begun in 1898, and is being continued at the present time.

DIETARY STUDIES.

Eleven dietary studies were carried on in connection with these investigations—three of college students' clubs and two in mechanics' families and six among families of mountaineers. The results of these latter studies have not yet been published. The results of the dietary studies are of much interest in themselves and are especially valuable when taken in connection with those of similar studies made in other parts of the United States.

DIGESTION EXPERIMENTS.

A large number of digestion experiments have been made by Professor Wait, 21 of these having to do simply with the digestibility either of single food materials or of food of more or less mixed diet. A large number of digestion experiments have been made in connection with studies of the effect of muscular work upon the digestibility of food and the metabolism of nitrogen.

In an average of 47 digestion experiments carried on for the purpose of studying the effect of muscular work upon digestion and nitrogen metabolism practically no difference was found in the proportions of nutrients and energy digested when the subjects were at rest and at work. Neither was there found any noticeable effect of the work in increasing nitrogen metabolism. A large number of similar experiments still await publication. The results of these bear out the results already published and indicate that a moderate amount of muscular work does not noticeably affect the digestion, nor does it cause increased metabolism of nitrogen when there is sufficient energy in the diet.

COMPOSITION OF TENNESSEE FOOD MATERIALS.

A large number of analyses of food materials have been made in connection with these investigations, nearly all of which are of distinctively Tennessee products. They included, besides the analysis of a large number of cuts of Tennessee-grown beef, analysis of a side of Tennessee beef, a side of Tennessee-raised mutton, and the composition of the flesh of 20 chickens. The conclusions from these analyses are that both beef and mutton raised in Tennessee are, as a rule, less fat than similar meats from cattle raised and fattened in the central and western parts of the country. The composition of chicken did not vary greatly from that of chicken raised elsewhere.

PUBLICATIONS.

Such of the results of investigations in Tennessee as are already published will be found in the following bulletins of the Office of Experiment Stations: Bul. No. 29, Dietary Studies at the University of Tennessee in 1895, by Chas. E. Wait; Bul. No. 53, Nutrition Investigations at the University of Tennessee in 1896 and 1897, by Chas. E. Wait; Bul. No. 89, Experiments on the Effect of Muscular Work upon the Digestibility of Food and the Metabolism of Nitrogen, conducted at the University of Tennessee, 1897–1899, by Chas. E. Wait.

VERMONT.

Investigations in this State are being carried on at the present time by Prof. J. L. Hills, of the Agricultural Experiment Station, the special objects being to study the dietaries of farmers' families and to determine the proportion of total nutrients furnished by dairy products. The results obtained up to the present time await publication.

VIRGINIA.

The first of the investigations in this State was made with the cooperation of the State University. Prof. J. W. Mallett carried on a number of studies regarding the physiological effect of creatin and creatinin, the nitrogenous materials which constitute the so-called meat bases—that is, the principal materials which are extracted when meat is boiled. It was found that these materials do not serve as nutrients for the body. The results were published in Bul. No. 66 of the Office of Experiment Stations, on The Physiological Effect of Creatin and Creatinin and Their Value as Nutrients, by J. W. Mallet.

Cooperating with the Hampton Normal and Agricultural Institute, dietary studies were made of negroes in eastern Virginia in 1897–98 by H. B. Frissell, principal of this institution, assisted by W. F. Schultz, and in another locality of the same region of Virginia by Miss Isabel Bevier, under a special authorization from the Department of Agriculture. Many of the families had very limited means

and little education. Some, however, had been under the influence of Hampton Institute, and the effect of education as shown by the improvement in their dietary habits was marked.

Of particular interest in these studies is the influence of the proximity to salt water upon the diet of the negro families. Fish formed an important part of their diet, replacing to a certain extent the bacon of the Alabama negro. In this way the protein in the diet was much larger than in the dietary studies in Alabama, approaching more nearly the average for persons under ordinary circumstances. The results of this investigation are published in Bul. No. 71 of the Office of Experiment Stations, on Dietary Studies of Negroes in Eastern Virginia in 1897 and 1898, by H. B. Frissel and Isabel Bevier.

SOME RESULTS OF NUTRITION INVESTIGATIONS.

DIETARY STUDIES.

Among the results of general interest are those of the studies of the actual food consumption of people of different classes and in different parts of the United States. These included dietary studies in families of farmers, mechanics, and men in professional life, of people in the congested districts of the slums of New York and Chicago, of negroes in the South, of Spaniards in the extreme Southwest, and of Chinese on the Pacific coast. The following table shows the extent of the dietary investigations:

Statistics of dietary studies.

	Number of studies.	Men.	Women.	Children.	Total.
Studies made in connection with nutrition investigations.					
Families and boarding houses	176	279	262	466	1,007
Students' clubs	23	372	179	6	557
Unclassified	14	4	2	5	11
Total	213	655	443	477	1,575
Studies made by Storr's Experiment Station.					
Families and boarding houses	37	60	58	35	153
Students' clubs	5	141	62	0	203
Institutions	2	510	562	0	1,072
Unclassified	13	11	0	1	12
Total	57	722	682	36	1,440
Miscellaneous studies.					
Institutions	64	4,303	3,205	0	7,508
Students' clubs	3	63	167	0	230
Families	2	3	4	1	8
Total	69	4,369	3,376	1	7,746
Grand total	339	5,746	4,501	514	10,761

The results of the more important dietary studies thus far made are summarized in the table following, which shows the average amounts of both the total nutrients in the food consumed, as calculated from the weights and chemical composition, and the digestible nutrients as esti-

mated by the use of the coefficients of digestibility assumed from the results of digestion experiments. The fuel value represents the amount of energy of the food that is available to the body. The table also includes the dietary standards that have been proposed, taking into consideration both the data obtained in dietary studies and the results of physiological experiments.

Summarized results of dietary studies in the United States.

[Quantities per man per day.]

	Number of studies included in averages.	Actually eaten.			Digestible.			Fuel value.	Nutritive ratio.
		Protein.	Fat.	Carbohydrates.	Protein.	Fat.	Carbohydrates.		
Persons with active work.		*Grms.*	*Grms.*	*Grams.*	*Grms.*	*Grms.*	*Grams.*	*Calories.*	*1:*
Rowing clubs in New England	7	155	177	440	143	168	427	3,955	5.6
Bicyclists in New York	3	186	186	651	171	177	631	5,005	6
Football teams in Connecticut and California	2	226	354	634	208	336	615	6,590	6.6
Persons with ordinary work.									
Farmers' families	10	97	130	467	89	124	453	3,415	8.2
Mechanics' families	14	103	150	402	95	143	390	3,355	7.5
Laborers' families in large cities	12	101	116	344	93	110	334	2,810	6.3
Laborers' families in more comfortable circumstances	2	120	147	534	110	140	518	3,925	7.6
Professional men.									
Lawyers, teachers, etc	14	104	125	423	96	119	410	3,220	7.1
College clubs	15	107	148	459	98	141	445	3,580	7.8
Men with little or no exercise.									
Men in respiration calorimeter	11	112	80	305	103	76	296	2,380	4.5
Persons in destitute circumstances.									
Poor families in New York City	11	93	95	407	86	90	395	2,845	6.9
Laborers' families in Pittsburg, Pa	2	80	95	308	74	90	299	2,400	6.8
Miscellaneous.									
Negro families in Alabama	20	62	132	436	57	125	423	3,165	12.4
Negro families in Virginia	19	109	159	444	100	151	342	3,625	6.8
Italian families in Chicago	4	103	111	391	95	105	379	2,965	6.5
French Canadians in Chicago	5	118	158	345	109	150	335	3,260	6.2
Bohemian families in Chicago	8	115	101	360	106	96	349	2,800	5.3
Inhabitants of Java Village, Columbian Exposition, 1893	1	66	19	254	61	18	246	1,450	4.7
Russian Jews in Chicago	10	137	103	418	126	98	405	3,135	5
Mexican families in New Mexico	4	94	71	613	86	67	595	3,460	8.7
Chinese dentist in California	1	115	113	289	106	107	281	2,620	4.9
Chinese laundrymen in California	1	135	76	566	124	72	549	3,480	5.7
Chinese farm laborers in California	1	144	95	640	132	90	621	3,980	6.2
Fruitarians	6	50	102	237	43	92	225	2,055	10
Dietary standards.									
Man with very hard muscular work (Atwater)	.....	175	(a)	(a)	161	(a)	(a)	5,500	7.2
Man with hard muscular work (Atwater)	.....	150	(a)	(a)	138	(a)	(a)	4,150	6.2
Man with moderately active muscular work (Atwater)	.....	125	(a)	(a)	115	(a)	(a)	3,400	6.2
Man with light to moderate muscular work (Atwater)	.....	112	(a)	(a)	103	(a)	(a)	3,050	6.1
Man at "sedentary" or woman with moderately active work (Atwater)	.....	100	(a)	(a)	92	(a)	(a)	2,700	6.1
Woman at light to moderate muscular work (Atwater)	.....	90	(a)	(a)	83	(a)	(a)	2,450	6.1

[a] Fats and carbohydrates in sufficient amounts to furnish, together with the protein, the indicated amount of energy.

The main outcome of these investigations of the amount of food consumed may be expressed in two statements. The differences in diet are in part such as would commonly come with the differences in the actual food supply in the markets, but they are influenced, to some extent, by race habits, and, to a still larger extent, by the material conditions of the consumer, including, especially, the income. The number of the insufficiently fed in the poorest parts of New York and Chicago is smaller than one would naturally suppose. The common opinion of physicians that a great many well-to-do people eat more than is best for their health is confirmed by comparison of the dietary studies with the commonly accepted standards of physiological demand.

The studies thus far made of the negroes and of the whites of the poorer class entirely confirm the general impression that the staple products are corn meal, pork, and molasses. The quantity of protein in such a diet is far below what is commonly believed by physiologists to correspond to the normal demand. The practical consensus of physiologists is that one thing greatly needed for the improvement of the material condition of these two large bodies of our fellow-citizens is a diet which will supply more protein. Fortunately this is entirely possible. It can be brought about by the more general use as food of leguminous plants, as the cowpea, and of home-grown beef.

It is interesting to note that the few dietary studies thus far made of the Chinese on the Pacific coast, who are supposed to have very much the same food as they do at home, contains a liberal amount of protein. This is contrary to the common opinion that the food of the Chinese consists mainly of rice and is especially deficient in protein.

One of the interesting results of the observation of the food of the people of the congested districts in New York and Chicago is that the errors in the dietary are due more to ignorance and the lack of wise economy than to lack of money.

WAYS IN WHICH THE RESULTS OF DIETARY STUDIES MAY BE USED.

Some of the more important and more noticeable results of dietary studies have been noted in the preceding paragraphs. How can these results be applied to the benefit of the individual, the class, or the human race? There are many ways in which this can be done. Perhaps one of the most important of these is in instruction concerning the nutritive value of the different food materials and their pecuniary economy. People should be taught how to improve their diet by the economical purchase of food materials best adapted to their physical needs. It will be found that by exercising care in the purchase and preparation of food a palatable and relatively inexpensive diet may often be obtained. Much is already being done along this line in many of the large cities, where the cost of many food materials must always be relatively high.

When the true character of the different kinds of food materials is more thoroughly understood diet will almost of necessity become more rational. With the advance of knowledge as to the physical requirements of the body it will become possible to establish standards which shall indicate the approximate amount of the different nutrients required. By this it is not to be understood that any definite rules for the consumption of food can be laid down, but simply that it will be possible to furnish a reliable guide for the purchase and use of foods.

The proper nourishment of the inmates of institutions where large numbers must be fed, such as schools, reformatories, prisons, and hospitals, is a subject that is attracting no little attention at the present time. In several instances studies have been made of the actual food consumption in such institutions, and quite recently an extended study of the food requirements of the insane has been carried on by one of the States. In many instances dietary studies have been made in schools, college clubs, etc., and the information obtained has been of much use. That such studies have been found to have a practical value and that the interest in them is widespread is shown by the fact that a considerable number have been undertaken by instructors and others interested, aside from those carried on by the Department of Agriculture.

When it so happens that large bodies of men are to be fed, as in the case of armies, or where the transportation of large amounts of food is difficult, the results obtained from dietary studies and similar investigations are of the utmost advantage in the selection of the food ration. It also becomes possible to select condensed rations which for emergencies shall furnish within the smallest space sufficient food for sustenance.

These are some of the more important uses that can be made of the results of dietary studies and similar investigations. They are sufficient to show the advantage to be obtained from extended research in this direction. At present only a beginning has been made, but every year adds to the data available.

In general, the object of dietary studies is not to limit the amount or variety of food to be used by the people, but rather to discover ways and means in which their dietaries may be improved and the available food supply be most economically used to maintain the body in good health and to make it an efficient instrument for the different forms of labor required by our complex civilization.

It is not the purpose of food chemists to prescribe weighed amounts of different foods as a physician prescribes medicines, but rather to show the actual nutritive value of different food materials and their relative economy as sources of nutrients, leaving the application of the knowledge to individuals. Although dietary standards are suggested, it is not necessary that the food each day should contain exactly

the kind and amounts of the different nutrients required by the standards. A slight deficiency one day will be made good by an excess the next, the body serving as a storehouse for reserve material. Experience has, however, shown that the body is best nourished when through long periods the food approximates the requirements of the so-called standards. Individual requirements and individual peculiarities will always affect the choice of foods. In the purchase of other things their value for the purpose for which they are intended is considered as well as their cost. Without doubt the same principle may be advantageously applied to the purchase of food. By the exercise of a wise economy, based on a knowledge of the real nutritive value of foods, a more satisfactory diet can be obtained for a less sum than is at present expended in many cases, or the cost of the diet may be diminished without lessening its nutritive value.

COMPOSITION OF FOOD MATERIALS.

One outcome of the nutrition investigations is that we have to-day a tolerably clear knowledge of the composition and nutritive values of our ordinary American food materials. Taking into account not only the results of analyses but also of digestion experiments, we are able to prepare tables showing the average quantities of digestible nutrients in a large number of the food materials in most common use. The table herewith is an illustration of this:

Nutrients and energy of digestible portion of some common foods, with nutritive ratios.

Kind of food materials.	Refuse.	Water.	Total indigestible nutrients.	Digestible nutrients.				Fuel value per pound.	Nutritive ratio.
				Protein.	Fat.	Carbohydrates.	Ash.		
ANIMAL FOOD.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Calories.*	*1:*
Beef, fresh:									
Chuck, ribs	16.3	52.6	1.4	15	14.3	.....	0.6	910	2.1
Loin, medium	13.3	52.5	1.6	15.6	16.6	.....	.7	1,025	2.4
Ribs	20.8	43.8	1.8	13.5	20	.....	.5	1,135	3.3
Round, medium	7.2	60.7	1.4	18.4	12.2	.....	.8	890	1.5
Shoulder and clod	16.4	56.8	1.2	15.9	9.3	.....	.7	715	1.3
Beef, dried and smoked	4.7	53.7	4.5	25.6	6.6	.....	5.5	790	.6
Veal:									
Cutlets, round	3.4	68.3	1.2	19.5	7.1	.....	.8	695	.8
Leg	14.2	60.1	1.1	15	7.5	.....	.7	625	1.1
Mutton:									
Leg	18.4	51.2	1.4	14.6	14	.....	.6	890	2.2
Loin	16	42	2	13.1	26.9	.....	.5	1,415	4.6
Pork, fresh:									
Loin, chops	19.7	41.8	1.8	13	23	.....	.6	1,245	4
Ham	10.7	48	1.9	13.1	24.6	.....	.6	1,320	4.2
Pork, salted and smoked:									
Bacon	7.7	17.4	4.4	8.8	59.1	.....	3.1	2,720	15.1
Ham	13.6	34.8	3.1	13.8	31.7	.....	3.2	1,635	5.2
Salt, fat	.....	7.9	5.4	1.8	81.9	.....	2.9	3,555	.....
Poultry:									
Fowl	25.9	47.1	1.2	13.3	11.7	.....	.5	765	2
Turkey	22.7	42.4	1.6	15.6	17.5	.....	.6	1,060	2.5
Fish, fresh:									
Cod, dressed	29.9	58.5	.5	10.8	.2	.....	.6	220	.1
Mackerel	44.7	40.4	.7	9.9	4	.....	.5	370	.9

Nutrients and energy of digestible portion of some common foods, etc.—Continued.

Kind of food materials.	Refuse.	Water.	Total indigestible nutrients.	Digestible nutrients.				Fuel value per pound.	Nutritive ratio.
				Protein.	Fat.	Carbohydrates.	Ash.		
ANIMAL FOOD—continued.									
Shellfish:	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Calories.*	*1:*
Oysters, solids	.....	88.3	0.6	5.8	1.2	3.3	0.8	225	1
Fish, preserved and canned:									
Cod, salt	24.9	40.2	5.1	15.5	.4	.....	13.9	325	.1
Salmon, canned	.....	63.5	1.9	21.1	11.5	.....	2	915	1.2
Eggs, uncooked	11.2	65.5	1.1	12.7	8.8	.....	.7	635	1.7
Dairy products:									
Whole milk	.....	87	.5	3.2	3.8	5	.5	310	4.3
Skim milk	.....	90.5	.3	3.3	.3	5.1	.5	165	1.8
Cream	.....	74	1.1	2.4	17.6	4.5	.4	865	18.4
Butter	.....	11	4.9	1	80.8	.....	2.3	3,410	.....
Cheese	.....	34.2	3.4	25.1	32	2.4	2.9	1,880	3
VEGETABLE FOOD.									
Cereals, etc.:									
Corn meal	.....	12.5	3.3	7.8	1.7	73.9	.8	1,640	10
Oat breakfast food	.....	7.8	5.1	14.2	6.6	64.5	1.4	1,800	5.6
Rye flour	.....	12.9	2.9	5.8	.8	77.1	.5	1,620	13.6
Rice	.....	12.3	2.9	6.8	.3	77.4	.3	1,625	11.5
Wheat flour, patent process	.....	12	3.4	9.7	.9	73.6	.4	1,635	7.8
Wheat breakfast food	.....	9.6	3.8	10.3	1.6	73.7	1	1,680	7.5
Bread, etc.:									
Bread, white wheat	.....	35.3	2.9	7.8	1.2	52	.8	1,200	7
Crackers, cream	.....	6.8	4.5	8.2	10.9	68.3	1.3	1,925	11.3
Vegetables:									
Beans, white, dried	.....	12.6	7.9	17.5	1.6	57.8	2.6	1,520	3.5
Beets, fresh	20	70	.8	1.1	.1	7.3	.7	160	6.8
Cabbage	15	77.7	.6	1.2	.2	4.6	.7	115	4.2
Potatoes	20	62.6	1.2	1.5	.1	14	.6	295	9.5
Squash	50	44.2	.4	.6	.2	4.3	.3	100	7.8
Sweet potatoes, fresh	20	55.2	1.6	1.2	.5	20.8	.7	440	18.3
Tomatoes	.....	94.3	.5	.7	.4	3.7	.4	95	6.6
Fruits:									
Apples	25	63.3	1.2	.3	.3	9.7	.2	190	34.7
Bananas	35	48.9	1.6	.7	.4	12.9	.5	260	19.7
Grapes	25	58	1.7	.9	1.1	13	.3	295	17.2
Oranges	27	63.4	1	.5	.1	7.7	.3	150	15.8
Strawberries	5	85.9	1	.8	.5	6.3	.5	150	9.3

The inquiries regarding the composition, digestibility, and nutritive values of bread made from different milling products of wheat have already given valuable results. These are being carried on in one Eastern State, Maine, where considerable wheat is grown and milled, and more especially, in Minnesota, in the midst of the wheat region of the Northwest. The facilities of some of the great flouring mills at Minneapolis have been made available by the proprietors for grinding large quantities of wheat of different types, the grinding being done so as to produce from the same lot of wheat the so-called graham flour, which contains nearly the whole of the grain of the wheat, the so-called whole-wheat flour, which contains nearly all but the outer portion of the kernel, and different grades of white flour from which the brans have been separated. These different kinds of flour have been made into bread and the digestibility of the different kinds of bread has been tested by actual experiments with healthy men. The outcome may be briefly stated as follows:

According to the chemical analysis of graham, entire-wheat, and

standard patent flours milled from the same lot of hard Scotch Fife spring wheat, the graham flour contained the highest and the patent flour the lowest percentage of total protein. But according to the results of digestion experiments with these flours the proportions of digestible or available protein and available energy in the patent flour were larger than in either the entire-wheat or the graham flour. The lower digestibility of the protein of the latter is due to the fact that in both these flours a considerable portion of this constituent is contained in the coarser particles (bran), and so resists the action of the digestive juices and escapes digestion. Thus while there actually may be more protein in a given amount of graham or entire-wheat flour than in the same weight of patent flour from the same wheat, the body obtains less of the protein and energy from the coarse flour than it does from the fine, because, although the including of the bran and germ increases the percentage of protein, it decreases its digestibility. By digestibility is meant the difference between the amounts of the several nutrients consumed and the amount excreted in the feces.

The digestibility of first and second patent flours was not appreciably different from that of standard patent flour. The degree of digestibility of all of these flours is high, due largely to their mechanical condition—that is, to the fact that they are finely ground.

These results are in accord with other accurate investigations, but their especial value lies in the fact that the experimental inquiry has been more thorough and extensive than any previously reported. The disparity between the conclusions just quoted and much of the popular belief, current newspaper statements, and, indeed, some of the teaching in physiological text-books, illustrates the importance of having such problems carefully studied.

METABOLISM EXPERIMENTS WITH THE RESPIRATION CALORIMETER.

From the more purely scientific standpoint, the interest of this nutrition inquiry culminates in the experiments with the respiration calorimeter. These have for their object the study of the transformations of matter and energy in the living organism. In other words, they represent an inquiry into the most fundamental and most important laws of nutrition. The apparatus used for the purpose is the Atwater-Rosa respiration calorimeter described on page 447.

The most important result thus far obtained by the use of this apparatus is what amounts practically to a demonstration that the law of the conservation of energy applies to the living organism. It has long been known that this law obtains in the inorganic world. The proof that this law obtains in the inorganic world was one of the great scientific achievements of the last century. It has, of course, been assumed and very generally believed that it must apply in the organic world, in the living being also, but a complete and satisfactory demonstration has not hitherto been made, although an approximation was found in

a number of European experiments with dogs. It would perhaps be going too far to say that the experiments with the respiration calorimeter by Professor Atwater and his associates at Wesleyan University have sufficed for the absolute and final proof, but certainly the results leave scarcely any room for doubt. As the outcome of 44 experiments with five different men, covering a period of 134 days, the ratio of the potential energy of the material oxidized in the body to the energy given off from the body in the forms of heat and muscular work, as measured by the respiration calorimeter, is as 1,000 to 999. The same ratio of 1,000 to 999 was found in the average of a number of experiments made to test the accuracy of the apparatus. Closer agreement than this could not be looked for.

The practical usefulness of this apparatus and method of inquiry will be realized more clearly when we consider that it gives us a means for measuring so accurately the transformations of both material and energy. It may be said also that the measurements of the income and outgo of material are nearly as accurate as those of energy. We have thus the means for studying the effects of different diets, different kinds and amounts of food in the body, the effects of different forms of work and of rest upon the consumption of material, the nutritive values of different food materials, and are thus enabled to get at the very foundations of the doctrine of nutrition.

FACTORS FOR DIGESTIBILITY AND FUEL VALUE OF NUTRIENTS.

The data obtained in the nutrition investigations may be used in deducing certain factors which are useful in various ways to students and investigators of similar problems, and to some extent also to those who wish to make practical application of the results. These factors are epitomized in the following table:

Factors for digestibility and fuel value of nutrients of food materials.

Classes of food materials.	Protein.			Fat.			Carbohydrates.			Energy proportion of total actually available.
	Proportion of total in mixed diet.	Digestibility.	Fuel value per gram.	Proportion of total in mixed diet.	Digestibility.	Fuel value per gram.	Proportion of total in mixed diet.	Digestibility.	Fuel value per gram.	
	Per ct.	*Per ct.*	*Calories.*	*Per ct.*	*Per ct.*	*Calories.*	*Per ct.*	*Per ct.*	*Calories.*	*Per ct.*
Meats and fish	43	97	4.25	56	95	9.00	.....	.....	.....	87
Eggs	6	97	4.35	4	95	9.00	.....	.....	.....	89
Dairy products	12	97	4.25	32	95	8.80	5	98	3.80	93
Animal food (of mixed diet)	61	97	4.25	92	95	8.95	5	98	3.80	89
Cereals	31	85	3.70	8	90	8.35	55	98	4.10	91
Legumes (dried)	2	78	3.20				1	97	4.05	83
Sugars	.....	.....	.....				21	98	3.85	98
Starches	.....	.....	.....				.....	98	4.10	98
Vegetables	5	83	2.90				13	95	4.00	91
Fruits	1	85	3.15				5	90	3.60	88
Vegetable food (of mixed diet)	39	85	3.55	8	90	8.35	95	97	4.00	92
Total food (of mixed diet)	100	92	4.00	100	95	8.90	100	97	4.00	91

The factors in the first, fourth, and seventh columns show what proportion of the total protein, fats, and carbohydrates in the average mixed diet is furnished by the food materials included in the different groups indicated. Those in the second, fifth, and seventh columns indicate the proportions of the different ingredients in the food materials of the various groups that are digestible when eaten in mixed diet. Those in the third, sixth, and ninth columns show how much energy the body will derive from one gram of each of the food materials included in the different groups, while the last column in the table shows what proportion of the total amount of energy in the food materials of the different classes will be utilized by the body.

With the exception of some important European determinations of heats of combustion, the data on which these factors are based are from late investigations in the United States. These include over 4,000 analyses of food materials; about 350 dietary studies; nearly 300 digestion experiments, mostly with men; several thousand determinations of heats of combustion of food materials and excretory products, and 30 experiments, continuing ninety-three days, with men in the respiration calorimeter, besides a considerable number of other experimental inquiries, including especially the determinations of the constitution of protein compounds in various materials. The results of computations by means of these factors have been found to agree very closely with those obtained in actual experiments, showing that the factors are reasonably accurate.

THE EDUCATIONAL INFLUENCE OF THE NUTRITION INVESTIGATIONS.

If the practical usefulness of these investigations is important, the educational influence is no less so. This is manifesting itself in a number of ways, but most of all in the bringing of the results of the inquiry directly into schools. Taking all the public schools and colleges in the country together, the number in which the results of these inquiries are being directly taught is relatively small. Nevertheless, the actual number of institutions in which teachers are including more or less of the outcome in their courses of instruction, especially in physiology, is already large, and growing with most encouraging rapidity. It has been the policy of the Department to deal very generously with schools and with teachers in the distribution of nutrition publications. Not only in cities, but in rural districts the schools manifest a large and rapidly growing demand for these publications. They appear to meet an actual want—one that has been rather dimly felt hitherto, but is now taking quite definite shape. The most active call has been from teachers connected with technical schools or the technical departments of colleges and high schools. That it has been

particularly active among a large number of cooking schools is of course natural, but it is scarcely less so among schools of medicine.

That the time for the development of these inquiries is especially opportune is shown by the use made of the results in the teaching of what is called domestic economy, or household economics. This represents a pedagogic movement of greater import than many realize. The movement is coming in response to a popular aspiration, but it has the earnest support of many of our leading educators, not a few of whom are emphatic in the expression of their belief in the wisdom of the popular demand and the possibility of making such instruction very useful, especially in courses for girls and young women. Educational experience shows that a certain time is required to bring any new subject first into scientific and then into pedagogic form. The science of food and nutrition has already assumed reasonably clear and accurate scientific form and is being rapidly brought into pedagogic form.

CONCLUSION.

From modest beginnings, with the aid of private individuals, these investigations under the auspices of this Department have assumed a magnitude quite out of proportion to their actual cost. By the extensive cooperation of individuals and institutions of various kinds with this Department a large amount of valuable work is being done in a systematic way, the results of which are made available to the public. In the judgment of competent experts it is more thorough in its scientific methods, more extended in the scope and amount of investigation, and more useful in the distribution and practical application of its results than any other inquiry of the kind ever undertaken in this country or in Europe. A very recent statement by a European investigator is to the point here. Dr. P. O. Smolenski, a well-known Russian authority on these subjects, has lately published in the Russian language, as an official document, an account of the nutrition investigations above described. He details the development of the inquiry, describes the methods, and cites the principal results. In commenting upon the inquiry of this kind in the United States, he lays especial stress upon both the amount and quality, in both of which he considers that the American investigators are already in advance of those in Europe. He refers to the small amount of public money expended for the purpose, and finds an explanation of the success in cooperative effort, and says that it is due to the great energy, the expert skill, and the remarkable organizing power of Americans.

LIST OF PUBLICATIONS OF THE OFFICE OF EXPERIMENT STATIONS ON THE FOOD AND NUTRITION OF MAN.

POPULAR PUBLICATIONS FOR GRATUITOUS DISTRIBUTION.

(Requests for these publications should be sent to the Secretary of Agriculture or to a Senator or Representative or Delegate in Congress.)

Farmers' Bulletin No. 34.—Meats: Composition and Cooking. By Chas. D. Woods. Pp. 29, figs. 4, charts 4.

This contains concise explanatory statements regarding the structure, composition, texture, flavor, and digestibility of meats; practical suggestions regarding different methods of cooking meats; and tables showing the composition and fuel value of different kinds and cuts of meat.

Farmers' Bulletin No. 74.—Milk as Food. Pp. 39, charts 2.

Treats of the nutritive value of milk, and contains suggestions as to combinations with other food materials to make well-balanced and economical dietaries.

Farmers' Bulletin No. 85.—Fish as Food. By C. F. Langworthy, Ph. D. Pp. 30.

Shows the food value of fish, the great importance of the fisheries of the United States, and the immense amount of nutritive material taken each year from the salt and fresh waters of this country.

Farmers' Bulletin No. 93.—Sugar as Food. By Mary Hinman Abel. Pp. 27.

The characteristics of cane sugar and other sorts of sugar are discussed, as well as the value of sugar as a food. The practical use of sugar in the diet of children and adults is spoken of, and general conclusions drawn as to the amount of sugar desirable in the diet and the form in which it may be consumed.

Farmers' Bulletin No. 112.—Bread and the Principles of Bread Making. By Helen W. Atwater. Pp. 39, figs. 3.

The results of a large number of experiments at the different experiment stations and at other American and foreign institutions on different problems connected with bread and bread making are summarized, as well as the information on these topics afforded by standard works. It is not the object of this bulletin to give recipes for making bread, but to explain the reason for the different steps in bread making in the light of recent investigations.

Farmers' Bulletin No. 121.—Beans, Peas, and Other Legumes as Food. By Mary Hinman Abel. Pp. 32, figs. 10.

Beans, peas, lentils, and other legumes, used fresh or dried, as articles of diet are described, and their food value as compared with other vegetables and with animal foods is discussed. The principles which govern the cooking of leguminous vegetables are treated, and statistics are given of the use of such foods and their importance in the diet.

Farmers' Bulletin No. 128.—Eggs and Their Uses as Food. By C. F. Langworthy, Ph. D. Pp. 30.

The composition of hen, duck, turkey, goose, and guinea fowl eggs is given, together with that of some egg products and egg substitutes. The bulletin discusses the food value of eggs, their flavor, digestibility, place in the diet, and related topics, as well as the preservation and marketing of eggs.

Farmers' Bulletin No. 142.—The Nutritive and Economic Value of Food. By W. O. Atwater, Ph. D. Pp. 48, charts 2.

Definitions are given of the principal terms used in discussions of food and nutrition, and the general laws of the subject are spoken of. Special attention is paid to the composition of food, dietary studies, digestibility, pecuniary economy of foods, and related topics, the text being supplemented by tables and charts. Errors in food economy are pointed out and practical suggestions made.

Circular No. 46.—The Functions and Uses of Food. By C. F. Langworthy, Ph. D. Pp. 10.

Definitions of a number of the terms used in discussing food and a statement of some principles of nutrition. The average composition of a number of the more common American foods is quoted, as well as the commonly accepted dietary standards.

Some Results of Dietary Studies in the United States. By A. P. Bryant. Pp. 14. Reprinted from Yearbook of Department of Agriculture for 1898.

A popular article describing methods of making dietary studies and discussing the differences in the food habits of people of different occupations and conditions—such as farmers, mechanics, Mexicans, negroes, and others. Some ways in which the results of dietary studies may be made practically useful are pointed out.

Development of Nutrition Investigations of the Department of Agriculture. By A. C. True, Ph. D., and R. D. Milner, Ph. B. Pp. 16. Reprinted from Yearbook of Department of Agriculture for 1899.

An historical and statistical account of the nutrition investigations conducted under the auspices of this Department. Many references are also made to American work which antedates these investigations and to later work conducted at American universities and other institutions.

The Value of Potatoes as Food. By C. F. Langworthy, Ph. D. Pp. 16, figs. 3. Reprinted from Yearbook of Department of Agriculture for 1900.

The structure and composition of the potato are spoken of, together with the changes brought about in cooking, the digestibility, place in the diet, and related topics.

FOR SALE.

(To secure these publications, address the Superintendent of Documents, Union Building, Washington, D. C., inclosing price given. Remittances must be made by cash or United States postal order. Postage stamps and checks not accepted.)

Bulletin No. 21.—Methods and Results of Investigations on the Chemistry and Economy of Food. By W. O. Atwater Ph. D. Pp. 222, charts 3, figs. 15. Price 15 cents.

This bulletin discusses food and its uses, the composition of food materials, the digestibility of food, preparation and cooking, uses of food in the body, metabolism of energy, pecuniary economy of food, dietaries and dietary standards, and errors in food economy.

Bulletin No. 28 (revised).—The Chemical Composition of American Food Materials. By W. O. Atwater, Ph. D., and A. P. Bryant, M. S. Pp. 87, figs. 4. Price 5 cents.

This contains tables showing the maximum, minimum, and average composition and fuel value of a large number of different food materials.

Bulletin No. 29.—Dietary Studies at the University of Tennessee in 1895. By Chas. E. Wait, Ph. D., F. C. S., Professor of Chemistry, University of Tennessee. With comments by W. O. Atwater and Chas. D. Woods. Pp. 45. Price 5 cents.

An account of three dietary studies made with the college club of the University of Tennessee and one dietary study of a mechanic's family in Tennessee, with a discussion of the results.

Bulletin No. 31.—Dietary Studies at the University of Missouri in 1895, and Data Relating to Bread and Meat Consumption in Missouri. By H. B. Gibson, S. Calvert, and D. W. May, University of Missouri. With comments by W. O. Atwater and Chas. D. Woods. Pp. 24. Price 5 cents.

An account of two dietary studies made with the college club of the University of Missouri and compiled information obtained from the students of the University regarding bread and meat consumption at their homes.

Bulletin No. 32.—Dietary Studies at Purdue University, Lafayette, Ind., in 1895. By Winthrop E. Stone, Ph. D., Professor of Chemistry, Purdue University. With comments by W. O. Atwater and Chas. D. Woods. Pp. 28. Price 5 cents.

An account of dietary studies in the families of a teacher and a tinner in Indiana, with a discussion of the results.

Bulletin No. 35.—Food and Nutrition Investigations in New Jersey in 1895 and 1896. By Edward B. Voorhees, A. M., Director New Jersey Agricultural Experiment Stations. Pp. 40. Price 5 cents.

The subjects of these investigations were: (1) The composition and cost of bread in New Jersey; (2) bakery experiments; (3) the composition and cost of milk in cities in New Jersey; and (4) a dietary study. The objects of this work were to secure (1) definite data in regard to the variations in the cost per pound of bread, and (2) positive information concerning the variations that exist in the composition of bread and the relative cost per pound of the nutrients contained in it.

Bulletin No. 37.—Dietary Studies at the Maine State College in 1895. By Whitman H. Jordan, M. S., Director Maine Agricultural Experiment Station. Pp. 57. Price 5 cents.

This investigation may be termed a feeding experiment with man, as in it an attempt was made to control the sources of protein, which was furnished in cheap and in expensive forms. The influence of an abundance of milk in a dietary was also studied, and the results obtained were compared with those of a dietary study made under normal conditions. The investigation concluded five dietary studies at the college commons.

Bulletin No. 38.—Dietary Studies with Reference to the Food of the Negro in Alabama in 1895 and 1896. Conducted with the cooperation of the Tuskegee Normal and Industrial Institute, and the Agricultural and Mechanical College of Alabama. Reported by W. O. Atwater and Chas. D. Woods. Pp. 69. pls. 2. Price 5 cents.

Results of an inquiry into the food of the colored population of the Southern States, especially as regards the kinds, amounts, and composition of the food mate-

rials used. It embraces also a consideration of the hygienic and pecuniary economy of their diet, its deficiencies, the ways in which it might be improved, and the steps which should be taken to bring about an improvement.

Bulletin No. 40.—Dietary Studies in New Mexico in 1895. By Arthur Goss, M. S., Professor of Chemistry, New Mexico College of Agriculture and Mechanic Arts. Pp. 23. Price 5 cents.

An account of two dietary studies with Mexican families of limited means and one study of a family in more comfortable circumstances. The composition of a number of foods typical of this region in New Mexico is reported, and the dietary studies are discussed in relation to their environment and to results of similar studies made elsewhere.

Bulletin No. 43.—Losses in Boiling Vegetables, and the Composition and Digestibility of Potatoes and Eggs. By H. Snyder, B. S., Almah J. Frisbie, M. D., and A. P. Bryant, M. S. Pp. 31, figs. 7. Price 5 cents.

This bulletin contains three articles: The first, by H. Snyder, is entitled "The Loss of Nutrients in Boiling Potatoes, Carrots, and Cabbages," and reports a number of experiments on the losses which these vegetables undergo when boiled in different ways. The second, entitled "The Digestibility of Potatoes and Eggs," by H. Snyder, reports experiments on the digestibility of boiled eggs in pepsin solution and digestion experiments with a man on a mixed diet of which eggs were the principal constituent. The third article is entitled "The Composition of Different Parts of the Potato and the Loss of Nutrients During the Process of Boiling," by Almah J. Frisbie and A. P. Bryant, and reports the composition of different parts of the potato and experiments on the loss of nutrients when potatoes are boiled in different ways.

Bulletin No. 44.—Report of Preliminary Investigations on the Metabolism of Nitrogen and Carbon in the Human Organism with a Respiration Calorimeter of Special Construction. By W. O. Atwater, Ph. D., C. D. Woods, B. S., and F. G. Benedict, Ph. D. Pp. 64, figs. 4. Price 5 cents.

A detailed description of a respiration calorimeter suitable for experiments with man is given, and the methods and apparatus employed in the collection and analysis of the liquid, solid, and gaseous excretory products are described. Four experiments are reported in which the subjects remained in the respiration chamber for from three to twelve days. The foods and excretory products were analyzed and the balance of income and outgo of nitrogen and carbon determined.

Bulletin No. 45.—A Digest of Metabolism Experiments in which the Balance of Income and Outgo was Determined. By W. O. Atwater, Ph. D., and C. F. Langworthy, Ph. D. Pp. 434. Price 25 cents.

A compilation including 2,300 experiments with man and 1,400 with domestic animals in which the balance of income and outgo of nitrogen, or nitrogen and carbon, with or without oxygen, hydrogen, or mineral matter was determined. The experiments are classified and arranged, and the tables of results are supplemented by text in which the experiments are described, the objects sought, the experimental methods employed, and the conclusions drawn being noted in more or less detail.

Bulletin No. 46.—Dietary Studies in New York City in 1895 and 1896. By W. O. Atwater, Ph. D., and Chas. D. Woods, B. S. Pp. 117. Price 10 cents.

An account of twenty-one dietary studies of families living in the congested portions of New York City, a family at a mission, and a day nursery at a mission. From the results obtained some deductions are drawn concerning improvements in the living of such families.

Bulletin No. 52.—Nutrition Investigations in Pittsburg, Pa., 1894–1896. By Isabel Bevier, Professor of Natural Science in the Pennsylvania College for Women, Pittsburg. Pp. 48. Price 5 cents.

The investigations reported in this bulletin are: (1) Six dietary studies—one of a professional man's family and five of families of mechanics and day laborers; (2) the composition and prices of bakers' bread in Pittsburg; and (3) the composition of bread and the changes which the materials undergo in baking.

Bulletin No. 53.—Nutrition Investigations at the University of Tennessee in 1896 and 1897. By Chas. E. Wait, Ph. D., F. C. S., Professor of Chemistry in the University of Tennessee. Pp. 46, figs. 2. Price 5 cents.

The investigations reported in this bulletin are: (1) Studies of the composition of different kinds of meat, including analyses of a side of native Tennessee beef divided into seventeen cuts, according to the usage of the Knoxville market, of a side of native Tennessee mutton divided into six cuts, and of twenty Tennessee chickens, as purchased in the open market; (2) dietary studies, including two mechanics' families living in Knoxville, and two college clubs; and (3) twenty-one digestion experiments with healthy men.

Bulletin No. 54.—Nutrition Investigations in New Mexico in 1897. By Arthur Goss, M. S., Professor of Chemistry, New Mexico College of Agriculture and Mechanic Arts. Pp. 20, pl. 1, fig. 1. Price 5 cents.

This bulletin includes an analytical study of a side of New Mexico range beef which was regarded as typical. The results were compared with studies of beef raised in other regions. A dietary study of a poor Mexican family was also reported.

Bulletin No. 55.—Dietary Studies in Chicago in 1895 and 1896. Conducted with the cooperation of Jane Addams and Caroline L. Hunt, of Hull House. Reported by W. O. Atwater and A. P. Bryant. Pp. 76. Price 5 cents.

In this bulletin fifty dietary studies among children, French Canadians, orthodox Russian Jews, unorthodox Russian Jews, and Bohemians living in the thickly congested district of Chicago are reported, as well as three dietary studies of professional men living in comfortable circumstances. Results are discussed and compared with the results of dietary studies made elsewhere.

Bulletin No. 63.—Description of a New Respiration Calorimeter and Experiments on the Conservation of Energy in the Human Body. By W. O. Atwater, Ph. D., and E. B. Rosa, Ph. D. Pp. 94, pls. 8, figs. 12. Price 10 cents.

The special features of the respiration calorimeter, which have to do with the measurement of the income and outgo of energy, are described. Experiments test-

ing the accuracy of the apparatus are reported in which heat was generated inside the respiration chamber by an electric current or by burning alcohol. Two experiments with a man were also reported.

Bulletin No. 66.—The Physiological Effect of Creatin and Creatinin and their Value as Nutrients. By J. W. Mallet, M. D., LL. D., Professor of Chemistry in the University of Virginia. Pp. 24. Price 5 cents.

A number of experiments are reported. It was found that creatin and creatinin, which make up the greater part of the nitrogenous material of most meat extracts, do not serve as nutrients in the body. The creatinin is excreted unchanged, while creatin is changed wholly or very largely into creatinin.

Bulletin No. 67.—Studies on Bread and Bread Making. By Harry Snyder and L. A. Voorhees. Pp. 51, pls. 2, figs. 3. Price 10 cents.

Two separate papers are included. In the first, Professor Snyder reports the composition of a number of samples of Minnesota bread as compared with its cost; studies of the loss of dry matter, carbon, and nitrogen; the production of soluble carbohydrates and acid; the behavior of wheat proteids; and the changes in the solubility of fat during bread making. Digestion experiments with bread made from patent roller-process flour and bakers' grade flour are also included. Professor Voorhees, in the second paper, reports experiments on the loss of nutrients in bread making, noting especially the changes in the fat, and discusses his investigations in relation to the work of others along similar lines.

Bulletin No. 68.—A Description of Some Chinese Vegetable Food Materials and their Nutritive and Economic Value. By Walter C. Blasdale, Instructor in Chemistry, University of California. Pp. 48, pls. 8. Price 10 cents.

The composition of a number of vegetable food materials in common use among the Chinese on the Pacific coast of the United States is reported and their food value, etc., discussed. The vegetable products include, among other materials, lotus roots and seeds, taro, lily bulbs and flowers, cassava, lichi nuts, Chinese olives, and water chestnuts.

Bulletin No. 69.—Experiments on the Metabolism of Matter and Energy in the Human Body. By W. O. Atwater, Ph. D., and F. G. Benedict, Ph. D., with the cooperation of A. W. Smith, M. S., and A. P. Bryant, M. S. Pp. 112. Price 10 cents.

A technical bulletin reporting progress in the experiments with the respiration calorimeter. The details of six experiments with healthy men are reported, in which the balance of income and outgo of matter and energy was determined. Check experiments, designed to show the accuracy of the apparatus, are also described in detail.

Bulletin No. 71.—Dietary Studies of Negroes in Eastern Virginia in 1897 and 1898. By H. B. Frissell, D. D., Principal of the Hampton Normal and Agricultural Institute, and Isabel Bevier, Professor of Chemistry at Lake Erie College. Pp. 45, pls. 3. Price 5 cents.

This bulletin includes two separate papers, which together report the details of nineteen dietary studies of negro families in eastern Virginia. Some had been under the influence of Hampton Institute, others had not had such training, while many families had very limited incomes. The results are discussed and compared with those of dietary studies of negroes in Alabama, and with averages of studies of families of different occupations and incomes in other regions.

Bulletin No. 77.—Dietary Studies of University Boat Crews. By W. O. Atwater and A. P. Bryant. Pp. 72. Price 5 cents.

Dietary studies are reported of the Harvard and Yale university and freshman boat crews at their quarters at their respective universities and at Gales Ferry before the annual boat race. A study of the captain of the Harvard freshman crew at Gales Ferry was also made. These investigations were undertaken primarily to secure data regarding the food requirements of men performing severe muscular work. The diet of the boat crews was found to contain more protein and to furnish more energy than that of students not engaged in such exercise. These and other observed facts are discussed in relation to the results of other dietary studies and the commonly accepted theories of nutrition.

Bulletin No. 84.—Nutrition Investigations at the California Agricultural Experiment Station, 1896–1898. By M. E. Jaffa, M. S., Assistant Professor of Agriculture, University of California. Pp. 39. Price 5 cents.

This bulletin reports four dietary studies of infants, one of the university football team during training, and one of a chemist's family. A digestion experiment with an infant on a milk diet was also made, as well as a metabolism experiment in which the balance of income and outgo of nitrogen was determined. The results are discussed at considerable length.

Bulletin No. 85.—A Report of Investigations on the Digestibility and Nutritive Value of Bread. By Chas. D. Woods, Director, and L. H. Merrill, Chemist, Maine Agricultural Experiment Station. Pp. 51. Price 5 cents.

This technical bulletin is a progress report giving the results of experiments with men on the digestibility of bread of various kinds when eaten alone and when forming part of a simple mixed diet. Artificial digestion experiments with the same sorts of bread were also made, and the metabolic nitrogen in the feces and methods of estimating it were studied. In the experiments with men the balance of income and outgo of nitrogen was determined. A test of skim milk versus water for use in mixing dough showed the value of the former, as the resulting bread was richer in protein than that mixed with water. The loss of nutrients which is observed in bread making was also studied.

Bulletin No. 89.—Experiments on the Effect of Muscular Work Upon the Digestibility of Food and the Metabolism of Nitrogen, conducted at the University of Tennessee, 1897 to 1899. By Chas. E. Wait, Ph. D., F. C. S., Professor of Chemistry at the University of Tennessee. Pp. 77. Price 5 cents.

Sixteen experiments are reported in which the effect of muscular work upon the digestibility of food and upon the metabolism of nitrogen was studied. The subjects were young men in good health and performed muscular work under different dietary conditions.

Bulletin No. 91.—Nutrition Investigations at the University of Illinois, North Dakota Agricultural College, and Lake Erie College, Ohio, 1896 to 1900. By H. S. Grindley and J. L. Sammis, E. F. Ladd, and Isabel Bevier and Elizabeth C. Sprague. Pp. 42. Price 5 cents.

This bulletin reports dietary studies. The two at the University of Illinois were made with the family of an instructor and a club of workingmen; the study at the North Dakota Agricultural College, with a club of woman students; and that at Lake Erie College also with a club of women, including students and instructors. The investigations are discussed and compared with the results of similar work carried on elsewhere in the United States.

Bulletin No. 98.—The Effect of Severe and Prolonged Muscular Work on Food Consumption, Digestion, and Metabolism. By W. O. Atwater, Ph. D., and H. C. Sherman, Ph. D., and the Mechanical Work and Efficiency of Bicyclers, by R. C. Carpenter, M. S. Pp. 67, figs. 3. Price 5 cents.

A six-day bicycle race at Madison Square Garden, New York City, afforded the authors an opportunity to study the effect of very severe and prolonged muscular work upon the consumption and digestibility of food and the metabolism of nitrogen. The results are compared with those obtained under other conditions of muscular work. In the chapter devoted to a consideration of the mechanical work and efficiency of bicyclers, the amount of work actually performed is discussed, as well as the efficiency of man considered as a machine, and related topics.

Bulletin No. 101.—Studies on Bread and Bread Making at the University of Minnesota in 1899 and 1900. By Harry Snyder, B. S., Professor of Chemistry, College of Agriculture, University of Minnesota, and Chemist of the Agricultural Experiment Station. Pp. 65, pls. 3, fig. 1. Price 5 cents.

Continuing earlier work, digestion experiments were made with bread from whole-wheat flour, graham flour, and standard patent flour, the flours all being ground from the same lot of hard Scotch Fife spring wheat. The standard patent flour, as shown by analysis, contained somewhat less total protein than the flours of lower grade, but was more thoroughly digested. Artificial digestion experiments with bread of different kinds were made as well as studies of the effect on digestibility of consuming different amounts of oatmeal and of bread, the effect on digestibility of increasing the proportion of starch in bread, and experiments in bread making.

Bulletin No. 102.—Experiments on Losses in Cooking Meat, 1898–1900. By H. S. Grindley, D. Sc., Professor of Chemistry, College of Agriculture, University of Illinois, with the cooperation of H. McCormack, M. S., and H. C. Porter, M. S. Pp. 64. Price 5 cents.

Twenty-nine experiments on the losses of material when meat is fried, stewed, and boiled are reported. The experimental methods followed are described and the results are briefly discussed. The present bulletin is a progress report.

Bulletin No. 107.—Nutrition Investigations among Fruitarians and Chinese at the California Agricultural Experiment Station, 1899–1901. By M. E. Jaffa, M. S., Assistant Professor of Agriculture, University of California. Pp. 43. Price 5 cents.

This bulletin includes six dietary studies, a digestion experiment, and a study of the metabolism of nitrogen made with persons living practically on a diet of fruit and nuts; also three dietary studies with Chinese engaged in light muscular work, moderate muscular work, and severe labor. The diet of the fruitarians furnished

less nutrients and energy than the average diet of persons of similar age and occupation consuming ordinary foods. Instances are, however, on record in which persons consuming a mixed diet have lived on as small amounts. The diet of the Chinese corresponded quite closely as regards nutrients and energy to that of Americans engaged in similar work. Studies like those here reported are useful in determining dietary standards and in similar ways. The results obtained are discussed in relation to the general laws of nutrition.

Bulletin No. 109.—Experiments on the Metabolism of Matter and Energy in the Human Body, 1898 to 1900. By W. O. Atwater, Ph. D., and F. G. Benedict, Ph. D., with the cooperation of A. P. Bryant, M. S., A. W. Smith, M. S., and J. F. Snell, Ph. D. Pp. 147. Price —— cents.

Continuing earlier work with the respiration calorimeter, details are reported of thirteen metabolism experiments with the respiration calorimeter, in which the balance of income and outgo of matter and energy was determined. Improvements in the apparatus and methods of experimenting are also reported, as well as the results of experiments designed to test the accuracy of the respiration calorimeter. The bulletin concludes with a chapter summarizing the results which have been obtained in experiments like those reported. These conclusions have to do with such questions as the total carbon dioxid and water excreted per day, the amount excreted at night as compared with those excreted during the day, and similar topics. In many cases new values are given for physiological constants.

PUBLICATIONS NO LONGER AVAILABLE.

(These publications can not be supplied by the Department of Agriculture or the Superintendent of Documents.)

Circular No. 43.—Foods—Nutrients—Food Economy. Pp. 6, diags. 2.

A very brief statement of the functions of food and the general principles of nutrition.

Farmers' Bulletin No. 23.—Foods: Nutritive Value and Cost. By W. O. Atwater, Ph. D. Pp. 32, diags. 2. Replaced by Farmers' Bulletin No. 142.

This contains definitions of the technical terms used in discussing the nutritive value and economy of foods, tables, and explanations of the nutritive value of common food materials, and suggestions regarding errors to be avoided.

Bulletin No. 56.—History and Present Status of Instruction in Cooking in the Public Schools of New York City. Reported by Mrs. Louise E. Hogan, with an introduction by A. C. True, Ph. D. Pp. 70, pls. 12.

This bulletin includes an account of the introduction, growth, and present status of teaching cooking in the public schools of New York City. Sample lessons are quoted which show the course at present followed and exercises, both compositions and drawings prepared by pupils, are also given.

Foods for Man. Pp. 7. Reprinted from Yearbook of Department of Agriculture for 1897. Replaced by Circular No. 46.

The functions of food are briefly described, and the method of calculating a dietary is given, as well as the composition of a number of the more common food materials.

Food and Diet. By W. O. Atwater, Ph. D. (Charts I–IV, size 26 by 40 inches.)

Chart I.—Nutrients of Food and Their Uses in the Body. This shows in tabular form the composition of food materials as purchased with examples of the different nutrients and functions of each. The definition of food is also given.

Chart II.—Composition of Food Materials. This shows by means of colored lines the composition and fuel value of a number of common food materials, both animal and vegetable.

Chart III.—Pecuniary Economy of Food. This gives the amount of a number of food materials which may be purchased for 10 cents, and shows by means of colored lines the composition and fuel value of each.

Chart IV.—Dietaries and Dietary Standards. This shows by means of colored lines the nutrients and fuel value of the dietaries consumed by the people of various conditions in the United States and other countries. The dietary standards for a man at little work, at moderate work, and at severe work are also given.

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